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IDENTIFICATION OF UNKNOWN SYNTHETIC FIBERS

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A method of qualitative analysis for the following synthetic fibers is presented: Dacron, nylon, viscose, acetate, Arnel, Darlan, Acrilan, Creslan, Orlon, Zefran, polyvinyl chloride, alginate, Dynel, Verel, Vicara, and Saran.

The method is primarily microscopical, solubilities being used when necessary or desired for further confirmation. In addition to observation of fiber morphology and optical behavior between crossed polarizers, the method involves observation of the direction of movement of the Becke Line and degree of fiber visibility. These observations are made with the sample successively immersed in one or more of four mounting liquids of known refractive index. This makes possible group separations and final confirmatory identification. Accurate determination of a fiber's refractive index is not necessary.

A brief discussion of principles involved, experimental manipulation, and equipment necessary precedes the analytical procedure.

Accuracy, speed, need of only very small samples, and generally not having to strip dyes are among the advantages of the method.

The purpose of the paper is to aid the practicing analyst, and the method presupposes familiarity with microscopical technique.

INTRODUCTION

THE increasing number of synthetic fibers has made the qualitative analysis of unknown fiber mixtures rather complex. Many techniques for fiber identification are in use and have their value to the analyst. Some are very time consuming, some difficult to carry out, and others give uncertain results.

The purpose of this paper is to report a rapid and accurate analytical procedure for the identification of sixteen synthetic fibers. It is intended as an aid to the practicing analyst, and it should be stated that a certain amount of microscopical technique is necessary to accurately carry out the analysis.

Because microscopical methods are generally the most useful and rapid to apply, this scheme of analysis relies most heavily upon them. Solubilities are used when necessary, and when further confirmation may be desired.

As new fibers appear, they may be included in the general procedure after suitable experimental observation. Occasional checks on commercial samples will show whether any change in fiber properties has occurred due to manufacturing changes.

Only small amounts of sample are required, and the tests may be performed on the original sample as stripping of dyes is rarely needed.

DISCUSSION

In addition to fiber morphology, the main identifying properties used are refractive index and optical behavior between crossed polarizers. This approach was reported by Heyn (*1, 2*) and reference to these articles is recommended. The use of the mounting liquids monochlorobenzene, methyl salicylate and 1-bromonaphthalene[1] was proposed by Heyn (*1*).

In the method to follow, accurate determination of a fiber's refractive index is not necessary. However, accurate observation of the Becke Line is necessary. The main experimental observation to be made is the *direction of movement* of the Becke Line. Briefly, the Becke Line is a fine bright line appearing at the edge of a fiber. This Becke Line appears to move either toward the fiber, or toward the mounting liquid when the microscope is *focused up*. The Becke Line moves toward the medium of higher refractive index when focusing is up. Axial illumination is used, with the microscope condenser diaphragm closed down to yield a moderately narrow cone of light. By means of a cap analyzer[2], which simply slips over the top of the microscope eyepiece, the fiber may be observed with the plane of light either parallel or perpendicular to it. This is accomplished by rotating the eyepiece and cap analyzer, which has the direction of vibration marked on it. Parallel means with the light vibrating in the direction of the long axis of the fiber, and "perpendicular", in the direction of the short axis. A cross hair eyepiece is most helpful. All observations are to be made with the cap analyzer in place and oriented in the direction specified. Only when the fiber is to be examined between crossed polarizers is the substage disc polarizer inserted. This equipment adapts the simpler monocular microscope for this work. Obviously, more elaborate polarizing instruments may be used when available. A magnification of approximately X215 is suggested. Bausch and Lomb neutral tint filters and a blue daylight filter were used at the ribbon filament light source.

When degree of fiber visibility is mentioned, reference is made to fiber substance only, and not to pigment in semidull and dull types.

In noting the direction of Becke Line movement upon focusing the microscope up, choose a portion of the fiber to observe where the width is most uniform, and avoid places where the fiber contour may cause narrowing and twists.

General checking against known fibers is desirable. A cross section of the unknown should be prepared and compared with knowns.

GROUP SEPARATION

GROUP 1——Mount in colorless mineral oil, n = 1.470, and examine under crossed polarizers. Fibers that show polarization colors: Dacron, nylon, viscose.

All other fibers, in all groups, are dull to bright silver when oriented

[1] Liquids of known refractive index may be obtained from Eastman Organic Chemicals, Rochester, NY.

[2] An inexpensive cap analyzer that fits over the eyepiece, and disc polarizer that fits into the substage filter slot, may be obtained from Bausch and Lomb, Rochester, NY.

properly. Saran may be a silver-lemon yellow. Very dark shades and black may interfere, light and medium shades do not. Retain slide for Group 3 examination.

GROUP 2———Mount in 1-bromonaphthalene, n = 1.657, and examine parallel. Becke Line moves toward fiber: Dacron.

GROUP 3———Mount in colorless mineral oil, n = 1.470, and examine perpendicular. Fiber is only faintly visible. Becke Line moves toward liquid: acetate, Arnel, Darlan.

Mount in toluene, n = 1.496 and examine parallel or perpendicular. Becke Line moves toward liquid: acetate, Arnel, Darlan.

In mineral oil, n = 1.470, all other fibers in all groups are visible and have Becke Lines that move towards the fiber both parallel and perpendicular. In toluene, n = 1.496, the same holds true.

GROUP 4———Mount in monochlorobenzene, n = 1.522.

a) Examine parallel. Fiber is only faintly visible. Becke Line moves toward liquid: Acrilan, Creslan, Orlon, Zefran.

b) Examine perpendicular. Fiber is almost invisible. Becke Line moves toward liquid. Now examine parallel and fiber is visible. Becke Line moves toward fiber: nylon, viscose.

c) Fiber swells and starts to dissolve: polyvinyl chloride (Rhovyl).

In monochlorobenzene, all fibers in remaining Group 5 have Becke Lines that move toward the fiber on focusing up when examined either parallel or perpendicular.

GROUP 5———Mount in methyl salicylate, n = 1.537.

a) Examine parallel. Fiber is only faintly visible or invisible. Becke Line moves toward liquid: alginate, Dynel, Verel, Vicara.

b) Examine parallel. Fiber is very visible. Becke Line moves toward fiber: Saran.

CONFIRMATORY TESTS

Prepare a cross section of unknown and compare it with knowns.

GROUPS 1 AND 2———Dacron, nylon, viscose.

Dacron has the highest index of refraction of all of the fibers considered in this paper. When mounted in 1-bromonaphthalene and examined parallel, it is the only one whose Becke Line moves toward the fiber. The Becke Line is good and the fiber is visible. Dacron is insoluble in concentrated hydrochloric acid at room temperature for 10 minutes (*3*).

Nylon, when mounted in monochlorobenzene and examined perpendicular, shows a Becke Line that moves toward the liquid and the fiber is almost invisible. When examined parallel, the Becke Line moves toward the fiber and the fiber is visible. The fiber is rod-like with no striations. Nylon is soluble in concentrated hydrochloric acid at room temperature for 20 minutes (*3*).

Viscose has longitudinal striations and a different cross section than the other fibers in Groups 1 and 2. In monochlorobenzene and examined parallel, the Becke Line moves toward the fiber and the fiber is visible. Observed perpendicular, there is no Becke Line and the fiber is practically invisible.

GROUP 3———acetate, Arnel, Darlan.

Mounted in mineral oil, acetate is much more visible when examined perpendicular than it is parallel. Arnel and Darlan remain about the same either way. Because Darlan's Becke Line is indistinct in mineral oil and confusion sometimes results as to which direction the Becke Line is moving, it is best to also examine in toluene. In this liquid, Darlan shows a distinct Becke Line that moves toward the liquid both parallel and perpendicular. All other fibers, except those in Group 3, have Becke Lines that move toward the fiber. Darlan's cross section is different and characteristic. Acetate is readily soluble in acetone at room temperature (*3*), whereas Arnel swells and Darlan is insoluble. Acetate is deformed, but insoluble in chloroform 10 minutes at room temperature while Arnel is readily soluble (*4*).

GROUP 4———a) Acrilan, Creslan, Orlon, Zefran; b) nylon, viscose; c) polyvinyl chloride (Rhovyl).

a) Orlon has a dog-bone cross section, while the other fibers in this subgroup (a) currently are round. Orlon also has longitudinal striations and twists due to fiber contour, whereas the others in (a) are rod-like, with only occasional or no striations and twists.

Creslan partially disintegrates when treated in 50% by weight zinc chloride (*3*), for 20 minutes in a boiling water bath, and the remaining degraded fibers pass through the holes in a #4 Gooch crucible upon filtering. The other fibers in (a) are insoluble and are retained by the crucible.

Acrilan's cross section sometimes shows some fibers with one side indented similar to a kidney bean. Bright Acrilan mounted in monochlorobenzene is faintly, but definitely, visible both parallel and perpendicular, with only a slight loss in visibility perpendicular. Under these conditions, bright Zefran is faintly visible parallel but is practically invisible perpendicular and difficult to locate at all. Creslan behaves similarly to Zefran in this respect.

Zefran, mounted longitudinally in mineral oil, shows frequent bends and at these points an abraded-appearing, nodule-like surface deformity, somewhat similar to that shown by Dacron.

b) Nylon and viscose are mentioned here only because of their behavior in monochlorobenzene. If necessary, apply confirmatory tests given under Groups 1 and 2.

c) Polyvinyl chloride (Rhovyl) is included in this group solely because of its characteristic behavior in monochlorobenzene. Mounted in this liquid, the fiber swells, and its pitted surface shifts to the center, giving a sort of medulla, which, after several minutes, breaks up and disappears leaving a colorless structure. In monochlorobenzene, the Becke Line of this fiber moves toward the fiber both parallel and perpendicular.

GROUP 5———a) alginate, Dynel, Verel, Vicara; b) Saran.

a) Calcium alginate has a characteristic cross section and is soluble in weak alkalies (*5*), whereas Dynel is insoluble even in strong alkalies at the boil.

Dynel has a characteristic multiform cross section, which identifies it. It is slowly soluble in acetone at 40° C for 30 minutes and is soluble in cyclohexanone (*3*). Verel is quantitatively soluble in warm acetone but insoluble in cyclohexanone (*6*).

Verel has a dog-bone or peanut cross section, which identifies it in this group, even though its cross section and longitudinal appearance is like Orlon. Verel, mounted in methyl salicylate, is practically invisible and shows almost no Becke Line parallel or perpendicular, whereas the other fibers in this group are at least faintly visible and show a Becke Line.

Vicara, in low deniers, has a round cross section which identifies it in this Subgroup (a). In high deniers it may appear as a mixture of dog-bone, elliptical or kidney bean, and may be distinguished from Verel, if necessary, by its solubility in 5% sodium hypochlorite for 20 minutes at room temperature (*7*).

b) Saran, mounted in methyl salicylate, is the only fiber in Group 5 whose Becke Line moves toward the

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A COMPARISON OF FABRIC TEAR TESTS

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Six tests have been compared for measuring tear strength on cotton printcloth and sheeting treated with softeners. The tests were the trapezoid, single-rip tongue, double-rip tongue, Elmendorf, wing rip, and pin methods. To emphasize the characteristic element of tear strength, which is the deformation of the fabric to distribute the applied load over its stress-bearing components, the single-rip tongue test is the most satisfactory. The double-rip tongue and the pin test are second and third choice. The other three tests are much less sensitive to the deformation factor in tear resistance.

INTRODUCTION

IN A recent paper (*1*), the problem of testing fabric tear strength was discussed, and the effect of characteristic finishing agents on tear strength as measured by three different tests was described. The conclusions drawn from this work were that there are two factors of primary importance in the tear strength of fabric and that their relative importance is different in the three tests examined. The two factors are 1) fabric deformability, which determines how the non-uniform tearing stress is applied to the load-bearing fabric components, and 2) the ultimate tensile strength of these components. The three tests studied were the Elmendorf (*2*), the single-rip tongue, and the trapezoid (*3*). All three were found to be equally sensitive to the tensile strength component of tear strength, but the tongue test was considerably the most sensitive to the deformability factor. The Elmendorf was less sensitive to the latter, and the trapezoid test was almost independent of it.

The present paper presents a brief comparison of these three tear tests with three others which have been suggested and used from time to time. These are the double-rip tongue, the wing-rip (*4*) and the pin test (*5*). Tear strength has been measured by all six tests on samples of cotton printcloth and sheeting, which have been treated with various levels of two softeners, which change the ease of deformability of the fabric by lubricating the fiber surfaces. The magnitude of the tear strength improvement observed is taken to be a measure of the relative importance of fabric deformability in the strength measured by each test.

EXPERIMENTAL

The two test fabrics used were an 80″ x 80″ cotton printcloth weighing four oz/yd, and 107″ x 97″ sheeting weighing six oz/yd. Both were desized and bleached. Samples of these were treated with aqueous solutions containing various levels of a quaternary softener (Triton K-60, a tetralkyl-ammonium halide) or of a very soft polyacrylate resin. The latter was an experimental material. The concentration levels used are given in Table I. The applications were made on a heavy laboratory padder with 80% pick-up, and the samples were stretched on pin frames and dried at their original dimensions for 10 minutes at 150°C. They were conditioned to the standard atmospheric conditions for at least 24 hours before carrying out the tests as described below. All of the tests were done in the warp direction only, and the results are given in Table I.

1) TRAPEZOID TEST———Samples as described in the ASTM procedure (*2*) were torn on the Instron tester at a jaw speed of two in/min. The average load during the first inch of tear was determined by using an integrator connected directly to the recorder of the tester.

2) ELMENDORF TEST———A 2.5″ x 6″ rectangle was prepared with the warp parallel to the long edge. Two tears across the warp were made with the Elmendorf pendulum tester (*3*), without using the auxiliary weight. The length torn was 1.63 inches. The results were recorded simply as scale readings.

3) SINGLE-RIP TONGUE TEST———A 3″ x 3″ sample was prepared with a one-inch cut in a side parallel to the warp direction. The two tails then formed were inserted into the opposite jaws of the Instron tester. The rate of jaw separation used was two in/min, and the average load during

TABLE I
Comparison of Tear Tests

fabric	treatment solution	tear strength: trap (lbs)	Elmen (scale)	tongue: single (lbs)	tongue: double (lbs)	wing (lbs)	pin (lbs)
printcloth	water	2.22	39.2	1.07	2.24	1.36	3.16
"	0.25% K-60	2.20	47.2	1.25	2.52	1.40	2.96
"	0.5% "	2.30	54.0	1.93	3.26	1.54	3.80
"	1.0% "	2.32	51.8	2.23	4.24	1.68	3.91
"	0.5% resin	2.53	44.2	1.96	3.33	1.56	4.12
"	1.0% "	2.49	43.5	2.01	3.58	1.67	5.30
"	2.0% "	2.55	45.2	2.19	3.60	1.76	5.14
"	3.0% "	2.66	48.2	2.26	3.80	1.81	5.48
"	4.0% "	2.66	46.5	2.31	4.02	1.78	5.42
sheeting	water	3.32	70.3	1.70	3.66	2.14	5.28
"	0.25% K-60	3.88	78.0	4.23	6.20	2.52	7.98
"	0.5% "	3.62	86.8	3.92	7.02	2.48	8.12
"	1.0% "	4.04	93.0	3.66	—	2.66	11.04
"	0.5% resin	3.96	76.5	3.69	8.68	2.56	7.70
"	1.0% "	4.26	82.5	5.24	9.41	2.84	10.93
"	2.0% "	4.22	95.0	4.82	9.20	3.12	9.95
"	3.0% "	4.50	97.8	4.63	8.30	2.98	9.16
"	4.0% "	4.64	95.0	4.50	6.90	3.00	8.30

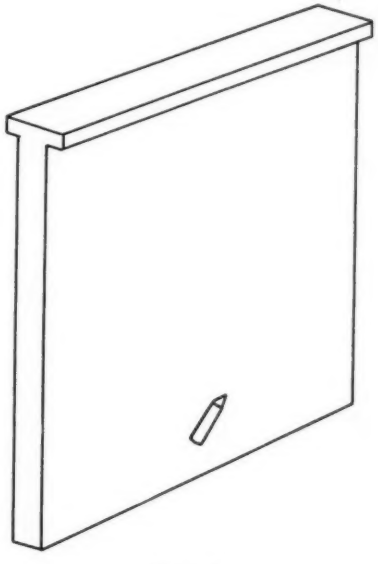

Figure 1
Pin-block for pin-tear test

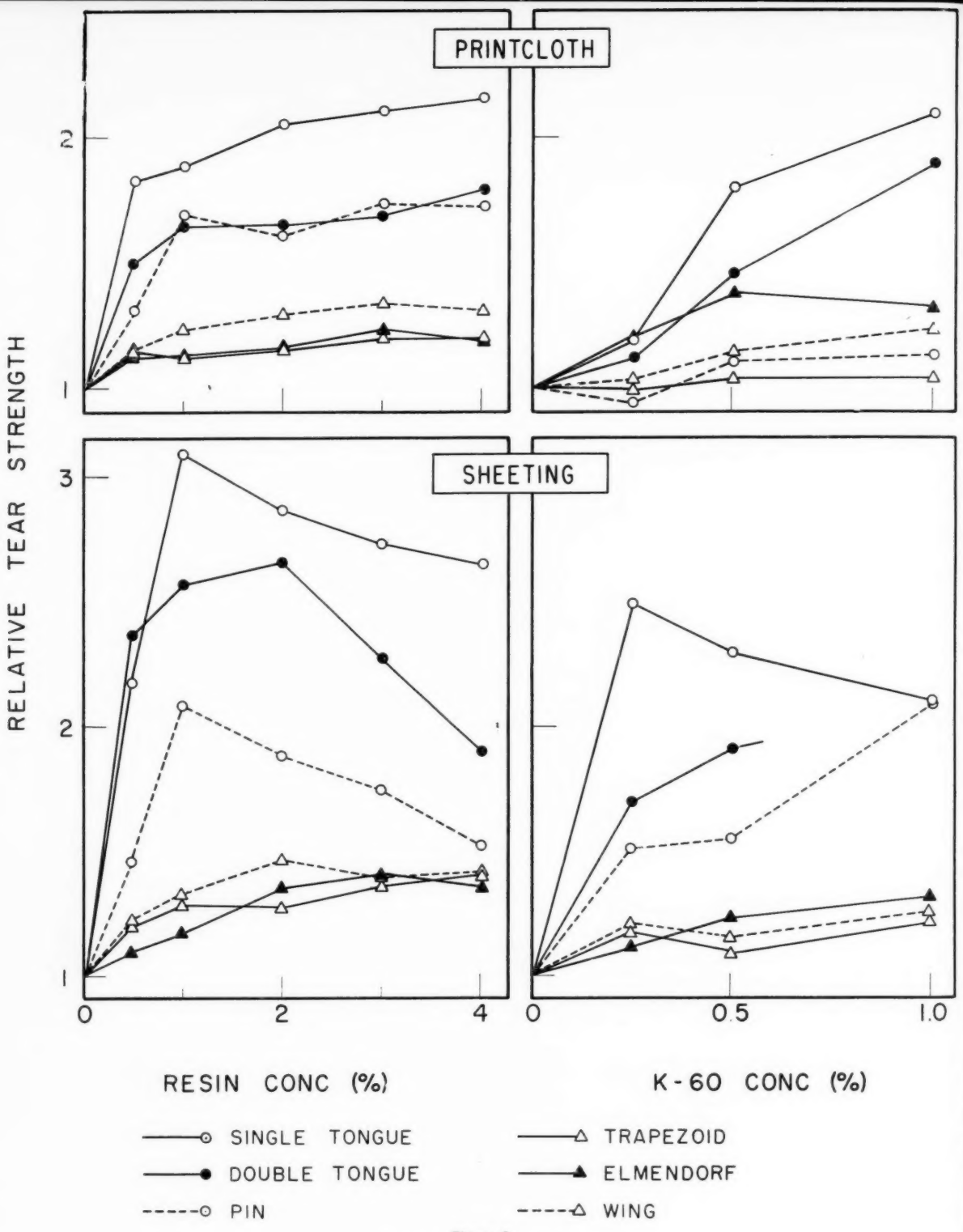

Figure 2
Comparison of tear sheets

the first inch of tear was determined with the integrator.

4) DOUBLE-RIP TONGUE TEST ——A 3" x 5" rectangular sample was cut out and two one-inch cuts were made in the short side one inch from either edge. The one-inch center flap thus formed was clamped in one jaw while the outer pieces were fastened in the other jaw of the Instron tester. The jaws were moved apart at two in/min and the average load for the first inch of tear was determined with the integrator. A double-rip tongue test is described in the British Standards Handbook for textiles (*6*), where a considerably larger sample is called for. The smaller samples used in this work appear to be satisfactory for the present fabrics and were used in the interest of sample economy.

3) WING-RIP TEST——This was

carried out exactly in the manner described by Ewing (*4*). The average load for an inch of tear was obtained by use of the integrator.

6) PIN-TEAR TEST——In the procedure suggested by Bellili and Kiger (*5*), one jaw of a tester was replaced with a C-shaped device whose arms were bored to receive a nail that could be pushed through them and through the test fabric in the central opening. The lower end of the sample was grasped in a regular jaw. The arrangement we have worked out is somewhat different. The pin is held at an angle in a brass block (as shown in Figure 1), which is clamped in the upper jaw of the tester. The block is four mm thick and has a shoulder along its upper edge to facilitate alignment and prevent slippage. Just above its lower edge is set a short steel pin, two mm in diameter, which slants up at a 60° angle to the block. Its end is cone-shaped, but not needle sharp.

The samples used were 3″ x 5″ rectangles with the short edge parallel to the warp. A short edge was clamped in the lower jaw. The pin in the block held by the upper jaw was then forced through the center line of the sample an inch above the lower jaw's edge. The jaws are driven apart at one in/min, and the average tearing load during the first inch of tear is determined with the integrator as before.

DISCUSSION

The results are most easily compared by plotting the relative tear strength of the treated to the untreated fabric as shown in Figure 2. The single-rip tear test again shows the greatest change due to the application of softeners. Our earlier interpretation of this (*1*) was that this test permits the greatest distortion of the fabric structure so that the tearing stress is distributed over a greater number of load-bearing elements of the fabric, and that because of this the test is very sensitive to treatments which affect the ease of distortion and interior movement of the fabric, such as the addition of fiber-surface lubricants. On the other hand, the Elmendorf, wing-rip, and trapezoidal tests are similar in being relatively unaffected by this treatment, although in the case of the quaternary on print-cloth the Elmendorf results show some improvement, as observed before (*1*). The pin test and the double-rip tongue tests in general show a considerable effect due to the softener action, and should probably be classed as intermediate in sensitivity to the fabric deformability factor.

The tensile strength of the fabric or its components can be most easily and accurately determined by a straightforward test of the usual sort, where the load is evenly applied over the test specimen. It would seem reasonable, then, to choose a tear test which shows a high sensitivity to the more nearly unique factor in tearing rupture, that is, the distortion of the fabric due to the non-uniform application of load. Using this criterion, the preferred procedure would be the single-rip tongue test, with the double-rip tongue and pin tests as second and third choices.

The wing-rip test was suggested by Ewing (*4*) to minimize transfer of the tear direction from one set of yarns to the other during a test. This is done by arranging the geometry of the test so that more of the longitudinal yarns (those not being tested) are engaged in applying the ripping stresses. The procedure is actually a single-rip tongue test with the tongues clamped at an angle to the jaw edge. While it reduces tear transfer, this is accomplished by emphasizing the tensile strength factor in tear resistance and, by the criterion suggested above, makes it less suitable.

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Identification of Unknown Synthetic Fibers——

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fiber. The Becke Line is indistinct both parallel and perpendicular. Saran is very visible both parallel and perpendicular, whereas the other fibers in Group 5 are only faintly visible. Dacron and polyvinyl chloride examined parallel would both have Becke Lines that move toward the fiber, but both are almost invisible in methyl salicylate, and both would have been identified earlier in the analysis. Saran is soluble in monochlorobenzene at the boil for 5 minutes (*4*).

SUMMARY

It is hoped that the data presented in this paper will be of assistance to those faced with the problem of identifying synthetic fibers singly and in blends, in all stages from raw stock through finished fabric.

Because of the great similarity of some of the newer synthetic fibers, both in micro appearance and solubility, a need was felt for a method of identification that did not depend solely upon these characteristics. This paper is the result of the attempt to overcome these difficulties, and the method has proven highly successful in the author's laboratory.

In some instances the Becke Line observations are very easy, and in others quite difficult, but in all cases can be performed when careful examination is exercised.

Experience will permit considerable short cutting of the procedure. This is true in cases where a fiber's cross section narrows it to a certain few, or immediately identifies it.

At the time of writing of this paper, Creslan, Zefran, Darlan, and Verel are in pilot plant or semiworks production. It is assumed that the properties of these fibers will be the same when they are in full production, but this should be experimentally checked out.

TABLE I
Refractive indices compiled from various sources

	Parallel to Axis	*Perpendicular to Axis*
Acetate	1.478	1.473
Acrilan	1.520	1.525
Alginate	1.536	1.531
Arnel	1.472	1.471
Creslan	1.517	1.521
Dacron	1.710	1.532
Darlan	1.480–1.485	1.475–1.480
Dynel	1.536	1.531
Nylon	1.582	1.519
Orlon	1.500	1.510
Polyvinyl Chloride	1.53	
Saran	1.60–1.63	1.60–1.63
Verel	1.538	
Vicara	1.536	1.531
Viscose	1.547	1.521
Zefran	1.512	

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Abstracts

The Dyeability of Zefran

Loughlin, J E, *Dyestuffs* **42**, 54-9, 100-02 June and September, 1957

The National Aniline laboratories have investigated the dyeing properties of Zefran, Dow's modified acrylic fiber. Following is a summary of their findings:

Vat Dyes. All heavy dyeings should be run at 180-200°F to obtain maximum yields (100% to 200% in strength, depending on the dye used, when compared to similar cotton dyeings). An addition of common salt is recommended. At high temperatures, excess caustic causes dulling of the shades; therefore, in dyeings run above 180°F, the caustic must be kept at a minimum. In light shades, temperatures as low as 70-100°F are necessary to achieve optimum levelling, which is also improved by an addition of glue to the dyebath. A treatment with perborate after dyeing is recommended to develop the shade. The fastness to wet processing and light of vat dyeings on Zefran is said to be at least as good as on cotton.

Sulfur Dyes. The conventional cotton dyeing method and that of Dow (replacing a part of the sulfide with hydrosulfite) give equally good results. The washfastness of sulfur dyes on Zefran is equal, the fastness to chlorine superior, and the fastness to light inferior, to that on cotton.

Direct Dyes. Dyed as for cotton, direct dyes are close in shade and strength to cotton so dyed. The washfastness and exhaust are better on Zefran; the lightfastness is generally poorer.

Metallized Wool Dyes. Dyeings were made with addition of ammonium sulfate, and formic acid when needed. The loss in strength in wash tests is about equal to that on wool, silk and nylon. In addition, white Zefran is usually stained. The light and perspiration fastness is very good.

Naphthol AS Series. Naphthol AS-SW was applied at 160-175°F, and after a salt rinse, coupled with Fast Scarlet 2G Salt. The fastness was about the same as on cotton, but white Zefran was stained yellow in the wash test.

Disperse Dyes. These have poor washfastness on Zefran.

Acid Dyes. These do not exhaust well on Zefran.

Developed Cotton Dyes. These dye well, but have poorer fastness to light and washing than on cotton.

Chemical Damage in Wool. III —Effects of Aqueous Chlorine

Houff, W H, Wills, C J, and Beaumont, R H, *Textile Research J* **27**, 961-5, December, 1957

The action of oxidizing agents on the chemical and physical properties of wool has been widely investigated. The wool damage caused by chlorine at high concentrations is well known, but little is reported on the effects of low concentrations of chlorine, such as are often used on papermakers' felts and in certain shrinkproofing processes. Since the degradative effects of chlorine oxidation are most apparent in wet wool, the changes occurring in the stress-strain properties of wet fibers after mild chlorination were evaluated by the authors, the alkali solubility of the wool after treatment was determined, and the amount of cysteic acid formed (by rupture of the disulfide bonds).

The authors give full particulars of the experimental work performed. From the evidence obtained, they conclude: 1) that very low concentrations of aqueous chlorine seriously decrease the usefulness of wet wool fibers under conditions similar to those found in many papermaking and bleaching operations; 2) that the amount of cystine converted to cysteic acid is closely related to the decrease in stress-strain properties of the wet fiber; 3) that the rate of degradation is accelerated by small temperature increases; 4) that degradation increases to a maximum at approximately neutral pH, and then drops off rapidly at a pH of 8.5-8.7; 5) that under a given set of conditions, the amount of degradation progresses with time until wet fiber utility disappears; and 6) that the rate of chlorine attack is many times greater when heavy agitation is used.

Thirteen references to the literature are cited.

The Theory of Dyeing Cellulosic Fibers

Valko, E I, "Proceedings of the Perkin Centennial" 427-442 (1957)

The theory of dyeing was developed in the last 25 years, rather lately compared with the history of the synthetic dye industry. This delay was, to a certain extent, unavoidable, since sufficient knowledge of the submicroscopic structure of fibers and of the nature of aqueous dye solutions was not previously available. More recent developments of the theory are characterized by refinements in details and by its application to specific problems.

A complete theory of substantivity has still to await the elucidation of molecular attraction forces by chemical physics, but this does not hinder the basic understanding of the dyeing phenomena. As a main achievement of the theory, mass action laws are formulated which explain and describe the equilibrium of dye absorption. Since the cellulose dyes are ionized and absorbed as ions, cellulose dyeing from the standpoint of absorption equilibrium is more complex than the dyeing of acetate and synthetic fibers with nonionic disperse dyes. This fact fully explains the tremendous effect of salt observed in direct dyeing of cellulose. It also defines the place of cellulose dyeing in the general framework of a unitary theory of dyeing.

The kinetics of dyeing is based on the concept that the rate-determining process in dyeing is the diffusion of the dye from the surface of the fiber into its interior. It can be considered as the second main achievement of the theory that it gives a satisfactory description and explanation of the rate of dyeing.

The third achievement of the theory of dyeing is the explanation of the transformations of the dye in the fiber. This was studied by X-ray diffraction and light-absorption measurements. The results indicate that soluble dyes and dye-formers are absorbed in monomolecular form by the fiber, but after they are insolubilized, they exhibit in many cases a tendency to crystallize. This explains the behavior of azoic and vat dyes on aftertreatment.

The theory provides the dyer with an understanding of his everyday problems, and enables him to supplant empirical craft by scientifically controlled methods. This will be accelerated as the validity of the theory is generally recognized and accepted as a basis for teaching and learning the technology of textile dyeing.

Twenty-nine references to the literature are cited.

Darlan— The First Dinitrile Fiber*

Smith, R D, *Textile Research J* **27**, 730-7, September, 1957

Darlan, a product of the B F Goodrich Chemical Co, is stated by the author to be made from a copolymer

*Editor's Note: Since the publication of this article, B F Goodrich Chemical Co has changed the name of its dinitrile fiber to Darvan.

of vinylidene dinitrile and vinyl acetate. The structure of the copolymer and the essential differences between vinylidene dinitrile and acrylonitrile are described.

Among the physical properties of Darlan are a dry tenacity of 1.75 g/d, an elongation of 25-35%, a sp gr of 1.18, and a softening temperature of 340-350°F. The loss in tenacity from exposure to high temperature (330°F) and outdoor weathering is extremely slight.

Darlan is probably somewhat less resistant than some acrylic fibers to the action of acids and alkalis. However, the only common textile operation known to degrade the fiber seriously is kier-boiling. It is unaffected by all common drycleaning solvents, moths, and mildew.

The fiber as produced is slightly off-white, but may be bleached with Textone or hypochlorite. It is a difficult fiber to dye; although it has ample affinity for dyes of some classes (disperse, cationic and azoic), it requires either high-temperature dyeing or the use of carriers.

Darlan/wool blends are said to have good wrinkle resistance and crease retention and are not subject to pilling.

It is stated by the writer that the fiber is still in the semiworks stage.

Reactivity of Cellulose

Urquhart, A R, *Dyer* **118**, 509, September 27, 1957

This paper is confined to one aspect of reactivity: the reasons underlying the great differences in reactivity of samples of cellulose that appear to be identical chemically, and differ only in physical form or structure. Moisture absorption studies exemplify these differences and build a theory that goes far to explain them in terms of variability of the availability of the reacting groups in the cellulose molecule.

Thus, purified cotton is in general in a state of low reactivity, regenerated cellulose in one of high reactivity, while mercerized cotton occupies an intermediate position. This picture is for most reactions very satisfactory, but in some, particularly acetylation, it is completely reversed, with ordinary cotton having a high reactivity, regenerated cellulose low, and mercerized cotton again intermediate. The cause of this effect is not known with certainty, but it may be due to the formation of a large number of relatively weak hydrogen bonds from one hydroxyl group to another in the drying that follows processes involving a large amount of swelling of the cellulose. If these bonds are weak enough to be broken in water vapor and aqueous systems, yet remain intact in anhydrous systems such as that normally used for acetylation, the normal order found for aqueous reactions could well be reversed in anhydrous ones.

Colorfastness Properties of Vat-dyed "Everglaze" Cotton

Anon, *Dyes & Chemicals Tech Bull (Du Pont)* **13**, 152-6, September, 1957.

Information on the effect of resin finishes on the colorfastness properties of dyed textiles has been much in demand, and particularly so since the introduction of Zeset S fabric stabilizer. The most recent information developed along these lines shows the effect of Zeset S on the fastness of vat-dyed Everglaze cotton when it is incorporated in the finish.

A full line of Du Pont vat dyes, with the exception of the blacks, were applied in medium depths of shade to mercerized cotton broadcloth by the pigment-pad-dry chemical pad-steam method. Blacks were applied in full shades by the pigment-pad-dry jig-development method. Portions of each dyeing were subjected to the finish, with Zeset S as the resin, in a textile mill. Original and treated portions were subjected to the following fastness tests: light (Fade-ometer) and crocking (dry and wet).

The results of these tests, and the shade change produced by the treatment, are tabulated.

The finish using Zeset S exerts an appreciable to considerable effect on the shade or strength of vat dyes. Although a few dyes exhibit a shade change, the effect is more apparent as a loss in tinctorial strength. It has been concluded that the change may be an optical illusion caused by an alteration in fabric surface characteristics by the finishing process.

Why High-Temperature Dyeing?

Iannarone Jr, J J, *Can Textile J* **74**, 47-55, December 27, 1957.

Dyeing of the synthetic fibers takes place in three stages; ie, diffusion of dye from the bath to the surface of the fiber, absorption of dye onto the fiber surface, and finally, diffusion of dye inside the fiber. These three stages may be considered to be in equilibrium with each other.

Because of the resistance offered by the fiber, diffusion of the dye therein proceeds rather slowly. Any factor, therefore, which would aid diffusion into the fiber and thereby shift the equilibrium of the system toward the right would be beneficial in exhausting the dye from the bath. Perhaps the most important factor which aids diffusion of dye into the fiber is temperature. As the temperature is increased, the excitation of both the dye and the long-chain fiber molecules is also increased. Hence, at higher temperatures, the spaces between the fiber molecules open and close more rapidly and to a greater degree than at lower temperatures, thereby providing a more open structure through which the dye can diffuse into the fiber. The more hydrophobic fibers (eg, Dacron) requiring a carrier for dyeing at 208°F, to allow diffusion of the dye, can be dyed at 250°F without a carrier.

Of course, if the dye can diffuse into the fiber with greater facility, it can also diffuse out of the fiber with equal ease. As a result, some dyes exhibit increased levelling or transfer at elevated temperatures.

Dacron polyester fiber is extremely hydrophobic and difficult to dye at or near the boil. At 250°, however, dyeing of the fiber can be readily accomplished even in heavy shades. Practically all of the disperse dyes normally used for dyeing this fiber are stable at this temperature at a pH below 6.

Orlon acrylic fiber should be dyed at 230°F at a pH of 4.5-5.5, at which most of the cationic dyes are stable. Above 230° the fiber shrinks and some dye decomposition occurs. Selected acid dyes are also used, by the cuprous ion technique, in pressure machines.

Nylon fabrics frequently show barré streaks when dyed with acid and direct dyes. Improved levelness is attained when selected acid dyes are applied at 235-250°F in the presence of an anionic surface-active agent (eg, Duponol D).

Acrilan acrylic fiber dyes well at the boil with acid and cationic dyes. It is expected, however, that the use of higher temperatures will result in improved levelling and penetration.

Dynel acrylic fiber is dyeable with acid dyes (cuprous ion process) and disperse dyes, at a maximum of 220°F. The high temperature permits shorter dyeing cycles and gives improved color yield.

Arnel triacetate fiber, like Dacron, is best dyed in heavy shades at 250°F. No carrier is needed. This fiber requires a heat treatment after dyeing.

The author also discusses the Thermosol method of dyeing, the fluid-bed technique, the use of molten urea, and some of the high-pressure dyeing machines.

Forty-three references to the literature are cited.

The Many Names of Nylon

Anon, *Modern Textiles* **38**, 33, 55, June, 1957.

Five companies are manufacturing nylon in this country at present, but they do not all produce the same kind of nylon. The author explains that there are two major polyamide fibers in use in the U S. One of these, first produced by Du Pont, and later by Chemstrand, is called nylon 6,6. The other, made by Allied, Enka and Industrial, is basically nylon 6.

Nylon 6,6 is made from adipic acid and hexamethylenediamine. Since each of these raw materials contains 6 carbon atoms per molecule, this type of nylon carries the chemical notation "6,6". Nylon 6 is made from caprolactam, which was originally developed in Germany. The caprolactam molecule contains 6 carbon atoms, and fibers produced from it are noted chemically as "nylon 6". There are still other types of nylon in production, such as nylon 6,8; nylon 6,10; and nylon 6,11.

Other varieties of nylon made in Europe and not yet reaching the U S, include the following names: Nailon, Rhodia-nylon, Ducilo nylon, Bayer-perlon, VGF-perlon, Phrix perlon, perlonseide, perlon-corseide, Steelon, Grilon, Silon, and from the Soviet Union, Kapron. It is pointed out by the author that no two polyamides are quite alike, due to differences in polymerization and subsequent yarn-making processes.

The author quotes the following from *Matthews' Textile Fibers:*

"Nylon is the generic term for any long-chain synthetic polymeric amide which has recurring amide groups as an integral part of the main polymer chain, and which is capable of being formed into filaments in which the structural elements are oriented in the direction of the axis. It covers a vast group of chemically related products and materials, the physical properties of which differ considerably."

BOOK REVIEW

Technique of Organic Chemistry — Vol III, 2nd Edition; Part I — Separation and Purification Part II — Laboratory Engineering

A Weissberger; Interscience Publishers, Inc, New York; Part I—$17.50, pp 873, 1956; Part II—$8.00, pp 391, 1957

"Organic chemistry, from its very beginning, has used specific tools and techniques for the synthesis, isolation, and purification of compounds, and physical methods for the determination of their properties. Much of the success of the organic chemist depends upon a wise selection and the skilled application of these methods, tools, and techniques, which, with the progress of science, have become numerous and often intricate."

These words of the editor, Arnold Weissberger, more than adequately state the reason for the need of a series such as "Technique of Organic Chemistry." The fact that the material of the first edition of this work has been enlarged upon greatly in the second is evidence of the rapid advances being made in laboratory techniques of organic chemistry. Also taking place is a systematization of laboratory techniques that allows one to minimize time expenditure in literature searches for expeditious approaches to practical synthetic problems.

Part I of Volume III deals with separation and purification practices; more specifically, "Diffusion Methods, Laboratory Extraction and Countercurrent Distribution, Crystallization and Recrystallization, Centrifuging, Filtration, Solvent Removal, Evaporation and Drying." Each of these sections has an extensive bibliography and is written by one or more outstanding workers in the field.

Part II of Volume III is entitled, "Selection of Materials for the Construction of Equipment, Heating and Cooling, Grinding, Screening and Classifying, Mixing, Operations with Gases."

These two volumes would seem to be usable additions to the research chemist's working library.—RJK

Technique of Organic Chemistry — Vol VII, 2nd Edition; Organic Solvents — Physical Properties and Methods of Purification

John A Riddick and Emory E Toops Jr; Interscience Publishers, Inc, New York

This volume retains the high editorial standards and usefulness to the research chemist and technician which have characterized other numbers of this valuable series. Complete physical properties of 254 important organic compounds are presented in tabular form using a separate table of properties for each compound. Ready reference to these tables is facilitated by separate indices based on 1) compound class, 2) compound name, 3) boiling point, 4) freezing point, and 5) dielectric constant.

A section is devoted to a definition and brief theoretical discussion of such important physical properties as boiling point, vapor pressure, density, refractive index, viscosity, surface tension, heat of vaporization, critical temperature and pressure, cryoscopic constant, ebullioscopic constant, electrical properties, flash point, and spectroscopy. In some instances equations are provided for extrapolating certain values to include conditions not covered in the tables.

The book is made especially useful by the inclusion of sections on Criteria of Purity and Purification Methods. Information is presented on each compound in the main tables concerning methods of preparation, criteria for purity, and methods of purification. In these pages is summarized a broad survey of the literature pertaining to each compound, and extensive references are provided. The number of compounds has been necessarily limited, but a wide variety of compound classes is represented including most of the common solvents. The research chemist and technician will find this volume generally useful in many fields of investigation, and through its use will save himself many hours of literature review.—GG.

Organic Syntheses — Vol 36

N J Leonard, editor-in-chief; John Wiley & Sons, Inc, New York; vi + 120 pp; 15.5 x 23.5 cm; $3.75

Directions for the preparation of 35 organic compounds are reported in Volume 36 of "Organic Syntheses". This volume maintains the high standards of its predecessors in its editing, experimental directions and indexing. Among the compounds in this volume of possible interest to textile chemists are: N-2-cyanoethylaniline and homologs (couplers in newer azo dyes), 1-cyano-3-phenylurea, N,N′-diethylbenzidine, o- and p-nitrobenzaldiacetates, and N-phenylbenzamidine, all of which are possible dye intermediates. The preparation of α-sulfopalmitic acid, of interest as a surfactant, is also described.—AS

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1957 Intersectional Contest———

AN EVALUATION OF TEST METHODS FOR FULLED FABRICS*

NORTHERN NEW ENGLAND SECTION

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A series of test methods has been applied to fabrics fulled to different degrees.

It is concluded that a test method which would evaluate the quality of a fulled fabric must establish not only the amount of the felting in terms of fiber randomness but also the nature of the distribution of the felted fibers through the thickness of the fulled fabric.

The measurements of weight, thickness, compressibility, abrasion, air permeability, fluid flow, and beta-ray penetration vary directly with the total amount of felting, but these parameters are found to be unrelated to the distribution of the felted fibers in the fabric and consequently are unrelated to the quality of fulling.

Recommendations based on this comprehensive analysis are advanced for the direction of further investigations of the measurement of fulling.

HISTORICAL & THEORETICAL BACKGROUND

ANYONE who has worn and washed a wool garment knows that wool tends to felt. This inherent property, especially when wool is placed in a warm, moist environment, has been explored by man to advantage from the dawn of textiles. This property of wool to felt is indeed unique; in fact, it is possessed only by certain other animal fibers. While man has succeeded in simulating the end result of this process, a true reproduction, to date, has not been achieved.

Just exactly what takes place when this fiber, wool, is placed in the appropriate medium is not known with certainty. It is generally conceded that the different coefficients of friction, ie, greater in the direction of tip to root than in the opposing direction, root to tip, result in a fiber migration into entanglements. These denser areas thus formed consolidate and reduce in area the whole fabric structure.

At first glance, it might be thought that any one of the three occurring dimensional changes of a fulled fabric, ie, length, width and thickness, must be directly related to the resultant quality of a fulled fabric. They are not, however, because the "quantity" of fulling (the state of fulling achieved) is a function not only of the *amount of randomness* produced but also of the *distribution of the randomness through the cross section of the fabric.* In other words, there are two components of fulling: 1) a quantitative characteristic, the actual amount of increase in fiber randomness, and 2) a qualitative characteristic, the distribution or uniformity of this increased randomness from the extreme outside surface to the center of the fabric. In normal fulling, the felting is not allowed to proceed beyond a given point. Therefore, it is far from the idealized state of complete felting by which a mat of completely randomly distributed, highly interlaced fibers would be obtained.

One well versed in the art of fulling realizes he cannot depend solely upon dimensional changes of the fabric to determine this quality of felting but that the fabric must be judged by visual and tactile means. By experience, a properly fulled fabric is considered qualitatively to be one which has an adequate "bottom" and a uniform fabric cover. By "bottom" is meant the degree of compacting and locking together of the yarn structure of the fabric to give a reasonably firm, uniform bonding of the yarns one to another by intermingling and interlacing of the fibers of adjacent yarns; and by "surface cover", the extent to which the surface fibers hide the basic yarn structure. Felting may be correct in total amount but still be of poor quality, because it has not taken place with the proper balance across the thickness of the fabric.

OBJECTIVE OF THE STUDY

A review of the literature has shown that, although much work has been done and reported on the subject of fulling, far less has been done with respect to the methods of measuring the parameters involved. In fact, the Committee found only two papers which propose test methods, and both these suggest the use of compressibility of the fibers as a means of assessing the degree of felting (*1, 2*).

When it is realized that technolog-

* Presented by Robert D Robinson on November 15, 1957 at the 36th National Convention, Hotel Statler, Boston, Mass.

ical advances in the textile industry, such as new surfactants and blends of fibers, natural and man-made, provide new scope to the finisher's art as well as a challenge to his skill, the need for test methods which permit him to measure process end points quantitatively becomes acutely apparent. It was this realization which prompted discussion of a study of the test methods. The immediate intent was to establish the feasibility of assessing total fulling at a given interval of processing. The longer-range plan was a projection into the manner or direction in which a quantitative definition of fulling coincident with a given amount of felting, in terms of nature of the distribution of fiber randomness, may be attained.

EXPERIMENTAL

The basic fabric chosen for this work is one with which there has been industry-wide experience. Other fabrics used and the results achieved are described in Appendix C. The fabric selected was the Government 16-oz wool-nylon shirting made from a blend of 45% wool fleece, 62's grade; 40% wool noil, 60's grade; and 15% nylon staple. This fabric contains 3-run warp and filling and is a four-harness weave, 2 right, 2 left.

The various specimens required for the study were prepared by fulling this fabric in full-scale plant equipment (a rotary fulling mill) to three end points judged as underfulled, regular fulled, and overfulled according to the usual methods of measuring the change in width and the change in the "yard mark" applied to the loom-state fabric along the selvage prior to starting the fulling.

The detergent formulation consisted of 5 oz/gal modified amine condensate and 4 oz/gal soda ash.

TESTS CONDUCTED

In our investigation, six different types of tests were studied. These are listed in the left hand column of Table I. With the exception of the fluid-flow and the beta-gauge methods, all have been variously applied to textile testing and are familiar to workers in this field. A word of explanation is thus in order for the fluid-flow and beta-gauge methods, which had not yet been explored for this purpose.

FLUID FLOW———Normal air-permeability techniques do not allow for the measurement of fluid flow at sufficiently low rates to examine the flow characteristics of the fabrics in the regions where fiber orientation could be of major significance. For this reason, experiments were carried out using a nontemperature-dependent, low-viscosity fluid. The Freeness tester, a unit currently being used in the paper industry to determine the degree of fibrillation of wood pulp in the beating operation, was employed in this work. The drain cock at the bottom of the apparatus is synchronized with a time clock, which starts or stops with the opening or closing of the drain cock. To obtain a true and reproduceable flow, Ucon* Lubricant LB-170X was selected on the basis that it shows minimum moisture absorption and viscosity change within small temperature differentials, basic criteria for definitive results.

The fabrics were tested by placing a specimen in the unit and measuring the time in seconds for the fluid to flow from the graduated mark of 400 ml to 300 ml.

BETA GAUGE RADIATION METHOD———The beta gauge used in these tests can be described simply as follows. A radioactive element, such as krypton or strontium, is used as the source of the radiation, which emerges from an area approximately 1.25" in diameter. Facing the radiation source across the gauging gap and at a distance of approximately one inch is a sensitive receiver in which the beta rays induce a flow of electricity in direct proportion to the extent of the flux. Since material interposed in the path of the flux alters it in proportion to its mass, the device can be used to determine changes in mass. It is pertinent to record the nature of the beta source in reporting the data, since this defines the size of the flux used.

In addition to the above, a microscopical examination of fibers removed from the fabrics was made to check any alterations in fiber surface resulting from the stresses during the fulling. It may be stated simply in passing that measurements of fiber diameter and examination of longitudinal characteristics gave no readily measureable clues. Staple analysis was impractical to perform because of difficulties in obtaining a truly representative and valid sample.

* Registered trademark, Union Carbide Corp.

TABLE I
Test methods applied for evaluation of fulling

Test	*Device Used*	*Conditions*
Compressibility	Thickness gauge	At 0.1 psi and 3.4 psi loadings.
Weight	—	Five specimens 2 x 2 conditioned at 65%RH and 70°F. Rechecked on Brabender oven and calculated at 12% regain.
Stoll flat abrasion	Stoll-All Universal wear tester	To first thread break—visually determined with head load one lb; air pressure of 4.0 lbs/inch; #0 Emery paper.
Air permeability	Fraizer perometer	At 0.5 inch of water.
Fluid flow	Freeness tester	Ucon lubricant LB-170 X — time to flow from 400 to 300 m level through fabric.
Beta-ray penetration	beta gauge	Current generated by beta-ray flux passing through the fabric to a sensitive receiver.

TABLE II
Summary data for several test methods applied to variously fulled wool-nylon shirting fabrics

Test	*Greige*	*Underfulled*	*Regular full*	*Overfulled*
Abrasion cycle	133	313	447	461
Air permeability (cu ft/min/sq ft)	227	65	40.6	40.3
Weight (oz/sq yd)	8.2	9.4	10.6	10.6
Beta gauge (Mv)	422	477	554	564
Thickness (in) 0.1-lb load	0.0423	0.0486	0.0535	0.0552
3.4-lb load	0.0363	0.0410	0.0460	0.0467
Fluid flow (sec/100 cc)	5.8	27.4	42.9	41.7

RESULTS

Table II contains a summary of pertinent data. The specific data for each test method are to be found in Appendix A. The data in Table III show the rate of change in relation to the greige fabric taken as standard. In Table IV are data obtained on specimens fulled in a sample fulling mill for varying periods of time with three surfactants: soap and alkali, which can be considered as standard on the basis of centuries of use; an alkylarylsulfonate surfactant, which is known in the industry to produce predominately surface fiber effects; and a polyoxyethylene surfactant, a new experimental product of unknown fulling properties.

DISCUSSION OF RESULTS

In approaching an analysis of the findings, it is pertinent to recall that the fabric used for this study had been fulled under conditions of felting which were known on the basis

TABLE III

Rate of change of measurements based on greige as standard for several test methods applied to wool-nylon shirting fabrics

Test	Greige	Under-fulled	Regular full	Over-fulled
Abrasion	1	2.35	3.36	3.46
Air permeability	1	3.49	5.60	5.63
Weight	1	1.14	1.29	1.29
Beta gauge	1	1.12	1.29	1.32
Thickness				
0.1-lb load	1	1.15	1.26	1.30
3.4-lb load	1	1.13	1.27	1.29
Fluid flow	1	4.73	7.40	7.20

TABLE IV

Data obtained with three test methods applied to wool-nylon shirting fulled with surfactants

Surfactant	Abrasion 30 min full	Abrasion 60 min	Abrasion 90 min	Abrasion 120 min	Weight 30 min	Weight 60 min	Weight 90 min	Weight 120 min	Beta Gauge 30 min	Beta Gauge 60 min	Beta Gauge 90 min	Beta Gauge 120 min
Soap (equal distribution of fulling)	168	210	277	360	8.68	9.20	10.22	10.75	0	15	41	73
Alkyarylsulfonate (unequal distribution of fulling—surface)	170	248	340	473	8.91	9.78	10.78	11.04	0	25	53	71
Polyoxyethylene thioether	200	230	280	507	9.30	9.57	10.23	11.39	12	24	34	68

of many decades of experience to produce a reasonably uniform distribution of randomness or felting through the cross section of the fabric. By experimental design, the parameter studied in this program is the total increase in felting with time. All of the tests which have been applied are dependent upon either the dimensional or geometrical characteristics of the fabric.

The data of Table II show that the various fabric attributes studied in the tests applied vary in every case directly with the total amount of felting with increasing time of fulling. All approaches lead to progressive increments in values as the amount of the randomness of fiber orientation increases. There is a minor discrepancy in the fluid-flow values for the overfulled fabric; otherwise all follow the same basic pattern.

A closer examination of the accumulated data shown in Table III reveals further that the rate of change in the test results decreases progressively as fulling time increases. This is consistent with the general behavior pattern one would expect from the theoretical concepts of the fulling process, irrespective of the quality of the results attained. As an example, the rate of change in weight between the greige and the underfulled is larger than the rate between underfulled and regular fulled and still less between regular fulled and overfulled. The same is true of air permeability. Some of the changes between regular fulled and overfulled are so small as to raise the question of the extent of statistical difference between the two.

However, the pertinent factor is not so much the statistical distribution of the results achieved, which can best be determined from larger populations of data than were possible in the present study, but rather the significance of the trends which are revealed. This simply means that, as the randomness of fiber distribution increases in progressive fulling beyond a particular value, the pattern of behavior of the fibers levels off. If the fluid-flow data are assumed to be completely significant, it may even be possible for the values to decrease when higher degrees of randomness of fiber have been attained.

Table III presents data in a manner which is considered to be more readily visualized in terms of the felting process as described above. Attention may be drawn to the fact that, in Table III, since we are concerned with the magnitude of the change in test values produced by fiber felting, the reciprocal ratios were recorded for those cases where the test data decreased with time. This permitted all of the data of this table to be on an increasing basis for ease of comparison against the greige taken as standard.

Since the figures of Table III express the magnitude of the change for a given amount of fulling, they can also be taken as indicative of the sensitivity of the test procedures. Taking the change between greige and underfulled, it can be seen that the sensitivity of weight, compressibility and beta-ray penetration appears too low (values lie between 1.12 and 1.29), whereas air permeability and fluid flow (two tests operating basically on common principles) appear to be much more sensitive (values 3.79 and 4.73 respectively). Similar situations apply between regular and overfulled. (Note value of 1.29-1.30 for the first three parameters and 5.63 and 7.20 for the latter two).

These comments do not consider the variations inherent in the test methods themselves and assume complete uniformity of the specimen being tested. There is reason to believe that gross uniformity does exist, but small area patterns are apt to be less uniform. However, it does not seem likely that the test variation could be large enough to disturb the indicated greater sensitivity of the flow test methods over the other tests used.

The data of Table IV must be considered in light of the fact that, while the fabric is the same as that producing the data of Tables II and III, both the felting time and the nature of the fulling medium were varied. As previously discussed, two of the surfactants have shown by industrial experience to produce different types of fulling in terms of "bottom" and surface. Soap and alkali produces good fulling whereas the sodium alkylaryl sulfonate type results in a very unequal distribution of felting or fiber randomness through the thickness of the fabric as compared with the fabric fulled with soap, which is appropriately taken as a reference if for no other reason than its long tenure.

The third agent was found by the expert judgment of the artisan, according to normal visual and tactile assessment, to produce an intermediate stage of felting, more nearly approaching the results of soap and alkali. Again here we note that, in all three cases, the measurements show progressive increases with time of fulling. However, the values of the three test methods applied show complete overlapping or equality of value.

At first glance, this would indicate that the degree of fulling is the same in all cases at the specific end points measured; however, experience and actual evaluation by standard subjective techniques show that they were not. Thus it must be concluded that the tests, under the experimental plan used, are directly related to the structure of the fulled fabric in only one way, ie, in terms of a total amount of felting, if defined as the total increase in fiber randomness. However, the results are independent of the distribution or nature of the felting through the thickness of the fabric.

All of the methods applied have thus distinguished fulled fabrics felted by the same mechanism, where the distribution of the felted fibers was essentially the same in all of the fabrics.

Data obtained with two serge fabrics, as shown in Appendix C, reveal basically the same general trends.

It seems apparent, therefore, that quantitative tests of the type screen-

ed in this survey fail to measure the nature of the cross-sectional distribution of fiber randomness. That is to say, such tests fail to measure the qualitative factors subjectively evaluated by artisans as "top" and "bottom" in fulled fabrics. If such is the case, it would appear that new paths must be investigated in an effort to develop an adequate test for fulling. Either a completely new experimental design must be developed, or one of the present tests must be refined so that it properly evaluates fulling by itself or else critically distinguishes some phase of fulling which will serve as an index to the total process, qualitative as well as quantitative. The possibility of developing such a test is not hopeless, in our opinion. Certainly this is a goal that merits the close attention of research efforts, both from the point of view of developing an adequate measuring technique and as a research device to better exploit the unique felting properties of wool.

CONCLUSIONS

Thus, on the basis of the experimental design and the nature of the findings, the work being reported has served to screen a series of potentially useful methods for the evaluation of fulling. It is demonstrated that all performed tests provide a measure of the total amount of fulling taking place at each interval selected. The basic qualitative and quantitative relationships in component factors, which correlate with the expert judgment of the experienced artisan, must await a separate experimental design. However, this study has cleared away much of the underbrush of the problem and has thereby exposed the pattern by which suitable experimental design for the assessment of fulling, according to quality values, can be achieved.

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It also appreciates the editing assistance of Sam Golub.

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APPENDIX A

Data accumulated from applications of test methods to various fulled wool-nylon shirting samples prepared in plant equipment

TABLE A-I
Fabric measurements taken during fulling

	Underfulled	*#1 Regular fulled*	*Overfulled*
Width (in)	62	58	57.5
Shrinkage (in) in yard mark	4	6	7.5
Time (min)	45	60	75

TABLE A-II
Measurements on Fabric #1 (wool-nylon shirting) during processing

	Not sheared			*Sheared*		
	Underfulled	*Regular fulled*	*Overfulled*	*Underfulled*	*Regular fulled*	*Overfulled*
Initial width after fulling & scouring (in)	62	58	57.5	62	58	57.5
Width after drying (in)	61	61	61	61	61	61
Width after relaxation (in)	—	57.78	57.75	61.25	58.75	58

TABLE A-III
Compressibility of wool-nylon shirting fulled to different degrees

THICKNESS OF RELAXED FABRIC (INCHES)

	0.1-lb Pressure		*3.4-lb Pressure*	
	Not sheared	*Sheared*	*Not sheared*	*Sheared*
Greige fabric	0.0423	0.0423	0.0363	0.0363
Underfulled	0.0503	0.0486	0.0434	0.0410
Regular fulled	0.0563	0.0535	0.0485	0.0460
Overfulled	0.0575	0.0552	0.0494	0.0467

TABLE A-IV
Increase in weight of Fabric #1 during fulling

WEIGHT (OZ/SQ YD)

	Conditioned 70° F—65% RH		*Bone dry + 12% regain*	
	Not sheared	*Sheared*	*Not sheared*	*Sheared*
Greige	8.05	8.05	8.16	8.16
Underfulled	9.7	9.3	10.08	9.38
Regular fulled	10.7	10.6	10.8	10.6
Overfulled	11.0	10.5	11.0	10.6

TABLE A-V
Abrasion Resistance of wool-nylon shirting fulled to different degrees (Stoll-QM Universal Wear Tester)

FLAT ABRASION CYCLES TO FIRST BREAK

	Finished fabric		*Relaxed fabric*	
	Not sheared	*Sheared*	*Not sheared*	*Sheared*
Greige	133	133	—	—
Underfulled	400	313	368	355
Regular fulled	420	447	415	450
Overfulled	500	461	540	495

TABLE A-VI
Variability in Stoll flat-abrasion values of one specimen of wool-nylon shirting read ten separate times

NUMBER OF CYCLES

	Left side	*Center*	*Right side*
Sampling #1	270	260	255
Sampling #2	250	240	260
Sampling #3	300	285	260
Sampling #4			240
Mean (area)	273	262	254
Mean (total sample)		263	
COV		7.2%	

TABLE A-VII
Weight and Stoll flat-abrasion characteristics of wool-nyon shirting fulled with several surfactants

Test	*Surfactant*	*Surfactant (oz/gal)*	*Builder (oz/gal)*	*Fulling time (min)*	*Weight (oz/sq yd)*	*Stoll cycles*
1	High-titer soap	5	0	30	8.68	168
				60	9.20	210
				90	10.22	277
				120	10.75	360
3	Sodium alkylarylsulfonate	5	0	30	8.91	170
				60	9.78	248
				90	10.78	340
				120	11.04	473
5	Polyoxyethylene thioether	5	0	30	9.30	200
				60	9.57	230
				90	10.33	280
				120	11.39	507

TABLE A-VIII
Air permeability of variously fulled samples of wool-nylon shirting and wool serge

AIR PERMEABILITY (CU FT/MIN/SQ FT)

WOOL-NYLON SHIRTING			16-OZ SERGE FABRIC		
	Not sheared	*Sheared*		*Not sheared*	*Sheared*
Greige	227	—	Underfulled	20.8	21.0
Underfulled	63.8	65.	Regular fulled	20.4	19.8
Regular fulled	38.6	40.6	Overfulled	19.9	21.2
Overfulled	40.7	40.3			

TABLE A-IX
Physical characteristics of finished fabric (Variously fulled samples of wool-nylon shirting)

	Not Sheared				*Sheared*		
Test	*greige*	*under*	*regular*	*over*	*under*	*regular*	*overfulled*
Crimp (%)	10.1	4.2	5.8	4.4	4.2	4.6	3.7
Elongation (%)	28.3	40.5	50.0	47.3	39.5	49.2	46.1
Load to rupture (lbs/in)	34.1	31.7	33.3	31.8	32.2	31.6	32.3

TABLE A-X
Physical characteristics of relaxed fabrics (Variously fulled samples of wool-nyon shirting and 16-oz serge)

		Crimp (%)	*Elongation (%)*	*Load to rupture (lbs/in)*
		WOOL-NYLON SHIRTING		
Not sheared				
Underfulled	warp	11.3	39.9	31.1
	fill	10.2	35.8	27.3
Regular fulled	warp	9.5	53.8	32.1
	fill	8.6	45.9	23.9
Overfulled	warp	9.1	53.3	32.8
	fill	7.4	52.5	32.5
Sheared				
Underfulled	warp	12.7	37.7	28.9
	fill	10.2	39.5	28.4
Regular fulled	warp	10.6	51.3	33.2
	fill	9.7	43.1	30.7
Overfulled	warp	10.4	47.8	33.0
	fill	8.7	48.0	32.3
		16-OZ SERGE		
Not sheared				
Underfulled	warp	11.7	31.6	
	fill	10.1	25.7	
Regular fulled	warp	11.2	34.3	
	fill	9.3	28.4	
Overfulled	warp	11.3	35.4	
	fill	9.8	28.1	
Sheared				
Underfulled	warp	10.2	35.3	
	fill	10.6	26.5	
Regular fulled	warp	10.6	37.6	
	fill	10.1	28.2	
Overfulled	warp	11.8	28.4	
	fill	9.6	25.1	

TABLE A-XI
Measurements of fibers removed from variously fulled specimens of wool-nylon shirting

	No. fibers measured	*Average width*	*Std dev*	*10-25.0M*	*25.1M & over*	*0.1M & over*
Griege	400	20.1	4.5	88.8%	11.2%	3.8%
Underfulled	400	19.3	5.3	88.5	11.5	3.3
Regular	400	19.0	4.5	88.5	10.5	1.8
Overfulled	400	19.6	4.4	89.0	11.0	3.3

TABLE A-XII
Fluid-flow characteristics of variously fulled specimens of wool-nylon shirting

Sheared	*Temp of oil (° F)*	*Viscosity (CPS)*	*Time (sec)*
Greige	76.0	65	5.8
Underfulled	76.5	64	27.4
Regular	76.0	65	42.9
Overfulled	76.3	64.3	41.7

TABLE A-XIII
Relative mass reading by beta gauge of variously fulled specimens of wool-nylon shirting

Treatment	*Not sheared (millivolts)*	*Sheared (millivolts)*
Greige	422	422
Underfulled	512	477
Regular	564	554
Overfulled	572	564

APPENDIX B

Data accumulated from application of test methods to various fulled shirting fabrics with different surfactants

TABLE B-I
Surfactant compositions used as fulling media

Test No.	Surfactant used	Surfactant (oz/gal)	TSPP (oz/gal)
1	High-titer flake soap	5	0
2	High-titer flake soap	5	2
3	Sodium alkylarylsulfonate	5	2
4	Polyoxyethylene ether	5	2
5	Polyoxyethylene thioether	5	2
6	Polyoxyethylene thioether	1.5	1
7	Aliphatic polyoxyethylene ether #1	5	2
8	Aliphatic polyoxyethylene ether #1	3	2
9	Aliphatic polyoxyethylene ether #1	1.5	1
10	Aliphatic polyoxyethylene ether #2	5	2
11	Aliphatic polyoxyethylene ether #3	5	2
12	Amine condensate	5	2

TABLE B-II
Changes in relation mass readings by beta gauge of wool-nylon shirting fulled in different surfactants*

INCREMENT OF VALUES FOR FULLING PERIOD IN MINS

Test	Surfactant used	30	60	90	120
1	High-titer soap	0	15.1	41.1	73.1
2	High-titer soap		23.6		
3	Sodium alkylarylsulfonate	0	25.0	53	71
4	Polyoxyethylene ether		12		
5	Polyoxyethylene thioether	12	24	34.5	68
6	Polyoxyethylene thioether		0		
7	Aliphatic polyoxyethylene ether		12		
8	Aliphatic polyoxyethylene ether		18		

*Each unit equivalent to 0.012 oz /sq yd with reference to the 30 mins specimen of test #1 as 0.

TABLE B-III
Weight and abrasion characteristics of wool-nylon shirting fulled with different surfactants for 60 minutes

Test	Surfactant used	Surfactant (oz/gal)	TSPP (oz/gal)	Weight (oz/yd sq)	Stoll
1	High-titer soap	5	0	9.20	210
2	High-titer soap	5	2	9.92	227
3	Sodium alkylarylsulfonate	5	2	9.78	248
4	Polyoxyethylene ether	5	2	9.21	222
5	Polyoxyethylene thioether	5	2	9.57	230
6	Polyoxyethylene thioether	1.5	1	8.88	203
7	Aliphatic polyoxyethylene ether	5	2	9.31	212
8	Aliphatic polyoxyethylene ether	3	2	10.09	247

APPENDIX C

Data accumulated from application of test methods to variously fulled serge fabrics

TABLE C-I
Descriptions of Fabrics #2 and #3

Fabric #2—18-oz worsted serge—100% wool 60's[B] grade; 2-ply warp and filling, 2/24's yarn; 2 x 2 weave to the right. Fabric[C] fulled and scoured with 4 oz/gal red oil[I] soap and 2 oz/gal soda ash.

Fabric #3—16-oz worsted serge—100% wool 60's grade; 2-ply warp, 2/26's yarn; 1-ply filling, 1/14 yarn; 4-harness warp twill to right. Fulled and scoured with 5 oz/gal modified amine condensate and 4 oz/gal soda ash.

TABLE C-II
Abrasion resistance of 18-oz serge fulled to different degrees Stoll-QM Universal Wear Tester

FLAT ABRASION CYCLES TO FIRST THREAD BREAK

	Finished Fabric Not Sheared	Finished Fabric Sheared	Relaxed Fabric Not Sheared	Relaxed Fabric Sheared
Greige	160	—	—	—
Underfulled	200	210	245	245
Regular fulled	220	218	320	265
Overfulled	268	257	350	283

TABLE C-III
Changes in relative mass readings by beta gauge of 16-oz wool serge fulled with different surfactants

INCREMENTS OF VALUES FOR FULLING PERIODS IN MINS

Test	Surfactant Used	30	60	90	120
1	High-titer flake soap	0	4.1	7.0	9.0
2	High-titer flake soap	0	5.4	17.8	18.0
3	Sodium alkylarylsulfonate	−13	0	6.4	16.6
4	Polyoxyethylene ether	− 3.4	− 2.4	6.6	11.8
5	Polyoxyethylene thioether	− 2	0.8	6.4	8.2
6	Polyoxyethylene thioether	−11.2	− 2.0		
7	Aliphatic polyoxyethylene ether #1	−11.6	− 8.2	− 7.0	− 3.8
8	Aliphatic polyoxyethylene ether #1	− 7.8	− 4.0		
9	Aliphatic polyoxyethylene ether #1	−13.2	− 3.2		
10	Aliphatic polyxoyethylene ether #2	− 7.0			
11	Aliphatic polyoxyethylene ether #3	− 4.8			
12	Aliphatic polyoxyethylene ether #3	− 3.6			
13	Amine condensate	2.6	14.2	17.2	33.2
	Greige goods	−42.0			

1957 Convention———

SCOURING GREASE WOOLS NEUTRAL*

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The problems involved in scouring raw wool are discussed and recent developments in this field are reviewed. The neutral scouring process for raw wool is based on the use of nonionic detergents. Laboratory tests are presented to show that optimum detergency is exhibited by a nonylphenol base nonionic containing 10.5 mols of ethylene oxide.

Several practical plant processes are given for three-, four-, and five-bowl scouring ranges. The neutral-scouring process gives good results for washing both coarse and fine wools, and millions of pounds of grease wools have been successfully scoured by this method. Wools scoured by the neutral process are softer, whiter, and more lofty than wools scoured by conventional alkaline processes.

Important aspects of the neutral-scouring process are discussed and current developments in wool scouring are noted.

INTRODUCTION

ALL natural fibers contain variable amounts of impurities which must be removed before they can be spun into yarns and woven or knitted into fabrics. Wool is no exception, as sheep are great collectors of soils, which are tenaciously retained by the clipped wool or fleece.

The natural impurities of raw wool are fats and suints (*1*) (dried perspiration salts), which serve to preserve the fleece and protect the animal. In addition, impurities picked up by the wool during pasturage will vary considerably depending upon the type of country on which the sheep graze.

Fine wools (80's, 70's, 64's) may yield as little as 25% to 40% fiber, while the coarser carpet wools (44's, 40's, 36's) yield as high as 75% to 85% fiber with the impurities making up the difference. A half blood wool (60's and 58's) has the following typical content of fiber and impurities (*1, 2*):

16.9% moisture
16.7% wool fat
0.4% other fat
10.3% water-soluble suint
3.6% sand, dirt, etc
52.1% wool fiber.

Washing the greasy raw wools is the first and one of the most important wet treatments in the processing of this fiber. Raw wool scouring, like many other textile processing operations, was for centuries considered an "art", and it is only in recent times that an effort has been made to place it on a scientific basis.

On superficial examination, wool scouring may appear to be a comparatively simple operation. Consider, however, that a normal day's production of the typical half-blood wool mentioned above in a four-or five-bowl scouring range would be in the neighborhood of 35,000 lbs. This would entail the removal of approximately 6000 lbs of wool grease, 3600 lbs of suint and 1260 lbs of sand and dirt to yield over 18,000 lbs of uniformly clean wool for subsequent processing

*Presented November 16, 1957 in the Ballroom of the Hotel Statler, Boston, Mass. during the 36th National Convention of AATCC.

DISCUSSION

HISTORY OF WOOL SCOURING ———Although synthetic detergents were introduced to the textile industry over thirty years ago, they made little headway against soap and soda ash, the traditional scouring agents for raw wool. Synthetic surface-active agents had several advantages over soap, such as stability to hard water and metal salts, good solubility, rapid rinsability and efficiency without high pH. A drawback to the adoption of synthetics in the early days was their $0.40-0.90 prices vs soap selling at $0.05 to $0.10 per lb.

After World War II, nonionic detergents based on alkylphenols became available in volume at reasonable prices. These detergents were found to be particularly well suited for scouring wool and were adopted by a number of mills to displace soap (*5*). During the past ten years, soap has been replaced gradually by the nonionics in alkaline scouring of raw wool.

The next logical move was to investigate the possibility of scouring without alkali. The wool trade has always been aware that alkali has an injurious effect on the wool, even if only a small amount is inadvertently retained by the fiber. Extensive laboratory and plant tests were conducted using a number of anionic and nonionic surfactants at various washing temperatures, and under different operating conditions, to eliminate alkali from the washing formula. This work showed that the nonionic-type surfactants gave good emulsification and detergency without alkali (*1, 4*) and, even when adjusted to the isoelectric point of wool (pH 5.0), were efficient cleansers. In just the last three years a large segment of the wool-scouring trade has adopted nonionic detergents for washing raw wools without alkali.

THE ALKYLPHENOL NONIONICS——— The postwar detergent market in this country has been characterized by a rapid growth of synthetics and a decline in soap consumption. Alkylphenol-ethylene oxide adducts have had a remarkable growth in the last 15 years and represent the largest segment of the nonionics. The preparation, properties, and textile applications of nonionics have been described previously (*6*).

Several reasons may be advanced for the success of the alkylphenol nonionics in the surfactant field. The following advantages of these detergents for wool scouring in particular can be cited:

1) Efficient detergent action on raw wool;
2) Stability in hard water;
3) Excellent lime soap dispersing action;
4) Resistance to heat, oxidation or reduction;
5) Nonsubstantivity to wool;
6) Good water solubility and rinsability;
7) Convenient liquid form; and
8) Availability at low cost from several suppliers.

A significant advantage of alkylphenol-based nonionics is that they can be modified by varying the alkyl group or the length of the ethylene-oxide chain. One manufacturer offers eleven products based on nonylphenol ranging from 15 to 95% ethylene oxide.

THE NEUTRAL - SCOURING PROCESS———The variables to be studied in developing a wool-scour-

ing process include the type of detergent, the detergent concentration, and the processing temperature. The type of wool to be scoured and the equipment available are usually fixed in any given mill. Early work showed that nonionic-type detergents, which worked well in alkaline scouring, were also best for the neutral-scouring process.

Additional studies on the neutral-scouring process indicated that greater efficiency was obtained when the temperature was increased to 145 or 150°F. Results of a typical laboratory test with three nonionics are shown in Table I. These tests were run on Texas 62's in a four-bowl laboratory train at 150°F. Using the first bowl as a suint, the second contained 1.5 g/l detergent, the third contained 0.75 g/l detergent, and the fourth bowl was used for rinsing.

It is apparent that the optimum results were obtained with the nonylphenol reacted with 10.5 mols of ethylene oxide. This product has a cloud point of about 160°F and substantiates the tenet that "nonionics exhibit optimum detergency a few degrees below their cloud point".

It was readily apparent in laboratory tests that neutral-scoured wool was loftier and whiter than alkaline-scoured wool. The superior color of neutral-scoured wool is probably due to three factors: a) iron salts in the water or the wool are not precipitated at a neutral pH, b) alkali-soluble ligneous matter in raw wool does not cause staining, and c) no discoloration of wool caused by alkali.

PRACTICAL PLANT PROCESSES ——Procedures for neutral scouring of wool in three-, four-, and five-bowl ranges are given in Tables II through VI. These procedures not only are representative of successful plant trials but are typical of current everyday practice at many scouring plants. It should be recognized that maximum scouring efficiency will require some modification in procedure, from plant to plant, depending primarily upon the particular equipment available and the type of wools being washed.

The wool should be well opened before scouring to facilitate separation and removal of solid matter. This will also hasten wetting of the entire fiber and removal of soils in the suint bowl.

The scouring liquors should not be retained for too long a period of time, otherwise their washing efficiency will fall off. Tests have indicated that borderline washing is obtained when the first scouring bowl shows a grease contents of more than 2% and the second scouring bowl contains more than 0.75% grease. It can be stated that both the first and second scouring bowls, in the counterflow system, can be retained for at least 24 hours provided that the settling tanks can be opened periodically to dispose of solids deposited at the bottom of the bowls. In some mills running certain grades of wool, these bowls can be successfully used for a week before a complete change of water and recharging with nonionic surfactant is required.

Experience indicates that optimum scouring results are obtained when approximately two-thirds of the grease is removed from the wool fiber in the initial scouring bowl, ie, wool leaving the first scouring bowl should have a residual grease content of around 5-7% for high shrinkage wools and around 1.5-2.5% for low shrinkage wools.

With this scouring efficiency maintained in the first scouring bowl, there is usually little difficulty in producing scoured stock with a satisfactory residual grease content.

Plant experience has fully confirmed laboratory findings that the nonylphenol-base detergent with 10.5 moles of ethylene oxide is a particularly efficient detergent. This type of nonionic can be expected to give top performance in plant equipment. To determine the quantity of nonionic detergent required to process a given lot of wool, 2 to 3% based on the weight of the grease present in the raw wool will be found to be workable figures.

Addition of electrolytes, such as common salt and sodium sulfate, has been suggested to improve the efficiency of nonionic detergents (4, 7). In the author's opinion, the use of such additives is not warranted because the slight savings in cost of surfactant is more than offset by the

(Concluded on page P159)

TABLE I
Efficiency of nonionics in neutral wool scouring

Range: Four 10-gallon bowls
Fiber: Texas wools, 62's
Temperature: 150° F

Nonionic	% Residual Grease
Igepal CO-530 (NP+6 ETO)	0.79
Igepal CO-710 (NP+10.5 ETO)	0.38
Igepal CO-730 (NP+15 ETO)	2.86

TABLE II
Neutral-scouring process for five-bowl range

Range: Five 48" bowls
Fiber: wool, 56's, 58's
Rate: 1500 lbs/hr

Bowl #	Nonionic detergent charge	feed/hr	Temperature (°F)
1 (1500 gals) suint	—	—	90
2 (2200 gals)	18 lbs	—	140
3 (2000 gals)	8 lbs	5 lbs	140
4 (1200 gals) rinse	—	—	130
5 (1000 gals) rinse	—	—	110

Flow system: 400 gals/hr from 4 to 3 to 2 to grease recovery
Ave residual grease: 0.56%
Detergent cost/100 lbs raw fiber: $0.12

TABLE III
Neutral-scouring process for five-bowl range

Range: Five 48" bowls
Fiber: Texas wools, 64's
Rate: 1500 lbs/hr

Bowl #	Nonionic detergent charge	feed/hr	Temperature (°F)
1 (1500 gals) suint	—	—	100
2 (1500 gals)	15 lbs	—	145
3 (1500 gals)	7 lbs	6 lbs	145
4 (1500 gals) rinse	—	—	130
5 (1500 gals) rinse	—	—	120

Flow system: 350 gals/hr from 5 to 4 to 3 to 2 to grease recovery
Ave residual grease: 0.43%
Detergent cost/100 lbs raw fiber: $0.13

TABLE IV
Neutral-scouring process for four-bowl range

Range: Four 60" bowls
Fiber: wool, 64's
Rate: 2600 lbs/hr

Bowl #	Nonionic detergent charge	feed/hr	Temperature (°F)
1 (2800 gals) suint	—	—	90
2 (2800 gals)	28 lbs	4 lbs	140
3 (2200 gals)	12 lbs	3 lbs	140
4 (2200 gals) rinse	—	—	120

Flow system: 450 gals/hr from 3 to 2 to grease recovery
Ave residual grease: 0.5%
Detergent cost/100 lbs raw fiber: $0.10

TABLE V
Neutral-scouring process for four-bowl range

Range: Four 48" bowls
Fiber: Fine fibers (camel hair, cashmere, etc)
Rate: 900 lbs/hr

Bowl #	Nonionic detergent charge	feed/hr	Temperature (°F)
1 (1200 gals)	4	2	140
2 (1800 gals)	4	2	140
3 (1800 gals)	1	1	130
4 (1200 gals) rinse	—	—	120

Flow system: 4 to 3 to 2 to 1 to sewer
Ave residual grease: 0.4%
Detergent cost/100 lbs raw fiber: $0.18

TABLE VI
Neutral-scouring process for three-bowl range

Range: Three 48" bowls
Fiber: carpet wools
Rate: 1500 lbs/hr

Bowl #	Nonionic detergent charge	feed/hr	Temperature (°F)
1 (1500 gals)	8 lbs	2 lbs	140
2 (1500 gals)	7 lbs	2 lbs	140
3 (1500 gals) rinse	—	—	125

Flow system: 3 to 1 to sewer, 2 independent
Ave residual grease: 0.55%
Detergent cost/100 lbs raw fiber: $0.085

Southeastern and Piedmont Sections———

THREE SIDES TO THE PUBLIC RELATIONS TRIANGLE*

M B EUBANKS

Director of Purchases and Transportation
Ware Shoals Div, Riegel Textile Corp
Ware Shoals, S C

CONTRARY to the opinions of some people, both in sales and purchasing, I hold there is very little difference between the buying and selling functions. The two sides of the table have a common denominator—that being, to effect a change of goods and/or services at a price satisfactory to both parties.

In trying to put facts together for this talk, I could not help but call on my personal experiences as a salesman. I was, for a number of years, on the road for my company, and traveled about half of this great nation of ours. From that experience I have determined, in my own mind at least, an office wherein public relations has a tremendous opportunity for function, and a spot where public relations is a responsibility that must never be ignored. That spot is the purchasing department of your business.

To me the deeds and actions of all purchasing departments are of the utmost importance to all businesses, be they small or large. Developing sound, friendly relations in business is one of our greatest assets. Though it cannot be measured in dollars and cents, we know it pays tremendous dividends. Good will is the aim of good public relations, and good will stems from right thinking and acting, and from true and sincere talk. Today's profits are yesterday's good will.

As a buyer, it is my responsibility to cultivate good sound sources of supply for my company, and to keep them. It is the duty of sellers to cultivate good sound accounts and keep them. Therefore, it behooves both the buyer and seller to try to understand each other and to strive for mutual understanding and confidence. Now, of all times, buyers and sellers alike must strive conscientiously for the utmost cooperation. It is a time when good will may mean the difference between good business and *no* business.

In the words of Stuart Hienrich: 'There has been much pious talk on this subject for years." Buying and selling are two aspects of the same transactions, mutually dependent upon each other, aided and abetted by respect and confidence in each other. This idea of better buyer-seller relations is not new; it has been expressed by sales and purchasing executives for a long long time. And nobody will argue the basic truth of this principle. But nearly all of us came out of World War II and the Korean incident with an accumulated list of grievances and resentments. Some were real, some fancied. Some legitimate, some just a matter of mind. But unfortunately many buyers and sellers compiled a "little black book" and just waited for the day when they could put their notes into effect and "get even" with those whom they felt had "done them wrong." About the only ones escaping the vengeance of this type of buying and selling were those who knew the value of good buyer-seller relationship.

Personally, I am not an advocate of the "little black book" method of doing business. All too many times personalities enter into cold business transactions and people and companies get hurt, sometimes badly. I feel that if we would but try to understand the other fellow we could deal harmoniously with all people. Surely the golden rule can be applied to our everyday business life as well as to our social life.

To my way of thinking, there are three sides to the *let's-get-together triangle*. I'll start by discussing some of the responsibilities of the purchasing agent, my own profession. The points I mention are obviously not all inclusive, but will in some small measure show how one purchasing agent feels and the policy to which he tries to adhere.

THE PURCHASING AGENT——— We have a responsibility to our accounts to know who they are. A couple of times a year I call on many of our suppliers. For the most part, the calls are social and very little actual business is discussed. But during these visits I have the opportunity to meet and know the people with whom we do business and to talk with the boys and girls in the offices who handle the details of our orders and with whom I speak via phone from time to time. At the same time I can well imagine that I am being sized up by those I meet.

Also the purchasing department has a tremendous public relations responsibility, and an opportunity to fulfil that responsibility by its treatment of the salesmen who call. It is generally conceded by road men that a company is known by the treatment extended its visitors. If there is any doubt as to that statement, all that I ask is that you join the salesmen in your hotel lobbies on a rainy night when they can't get out. You'll hear the names of quite a few buyers brought out, and there will be appropriate adjectives attached thereto. This I know from my own road experiences.

In most companies, the purchasing department is the reception center. All who come through this office should be made to feel at home. Every salesman is entitled to his alloted time and should be given ample opportunity to present his case. A wise purchasing agent, even though he has heard most of the speeches many times, will listen courteously. He may find one thing that he has been looking for and one which his pet supplier fails to deliver. Then too, common courtesy is so inexpensive and goes so very far. You can't buy from everyone and most of the fellows appreciate this fact. But when you can't buy, the salesman should know why, and at the same time should be assured that the door is not closed and that he is welcome back at any time to try again. We must cultivate these representatives, for we must never lose sight of the fact that they are in much closer touch with production than we are in our offices. We must remember also that, through the long seller's market following the war, the salesman's job was no bed of roses. It was his job to advise

*Presented December 27, 1957 before the Southeastern Section at the Atlanta Biltmore Hotel, Atlanta, Ga, and January 25, 1958 before the Piedmont Section at Clemson, SC.

accounts of disappointing delays and to try and minimize the effects of such delays on the buyer and his operations. So I feel that we, who represent our companies in the buying field, owe a definite responsibility to the road men, and in filling our responsibilities properly we will take a great step in advancing public relations and good will.

Also, we, who are buyers, have a definite responsibility to our section of the country. We must pay closer attention to our buying policies, and sellers to their selling policies, if we expect to keep abreast with the rest of the nation. I feel that we should trade at home wherever possible, that purchases, insofar as possible, should be made in the territory in which a company operates.

This reasoning does not spring from altruism, but from the very practical logic that general betterment of business conditions within the area will more than offset any initial price saving and will eventually lead to price equalization.

The Southern buyers' opportunity to purchase manufactured products within the area was at one time limited, but our position has improved tremendously over the past two decades. We now have the fastest-growing chemical empire in the world along our Gulf Coast. Sixty companies now produce more than 200 organic and inorganic chemicals in more than eighty plants. Our mineral products amount to 44% of the nation's total, our synthetic rubber production amounts to 90% of the national total. Our pulp production is more than 25,000 tons a day. All of this, plus other fabulous developments in our area, today offer the Southern buyers and sellers a great challenge and fine opportunity to help further the progress of this section of the country.

The responsibilities of the buyer are many, but in carrying them out he has a great opportunity to build better relations with his vendors, and the public in general. This, of course, is a must if he is to be successful in his endeavor to keep his materials coming in on time and at the right prices and quality.

THE SALESMAN———The second side of this "let's-get-together" triangle is the salesman. "We must remember that the purchasing agent and the salesman are fully appointed representatives of their companies, they are the companies in any given transaction." (Hienrich). These men on the firing line take their role as representative very seriously. Today's salesman has upgraded his profession by leaps and bounds over the old days of selling. He realizes too the value of buyer-seller relations and good public relations. He knows he must be well thought of to sell anything.

A moment ago I mentioned the fact that sales representatives were due all courtesy and consideration. By the same token he must be deserving of any consideration accorded him. He should be sold on the idea that he is no longer the "peddler" or "drummer" of the old school of selling. But rather that he is the representative of a fine business house, whose code of ethics and whose business standards are second to none. And too, that he represents his management, which consists of businessmen of high caliber. The salesmen, as well as the buyers, should be schooled in courtesy and consideration for others.

The old days of high-pressure salesmen are gone, or should be. I do not for a moment mean there should be any lack of enthusiasm or energy. But the blustering, noisy, high-pressure individual is rather distracting, if not obnoxious.

I feel that we all love a good joke; for the most part we all like clever stories; yes, even to the 'risque. But deliver me from the salesman who comes in and takes a quick look around to be sure your secretary is out of sight so he can tell you a truly lousy joke that makes your blood curdle. Just plain decency demands that this type of individual be taken off the road. He is bad public relations. He hurts his company's standing in the community of business.

There is one type of salesman who always gets me. He is the one who "just happened to be down this way and thought I'd drop in." What a lie! Who ever heard of a salesman from Atlanta or Charlotte driving 150 or 200 miles from his office and just happening to think how nice it would be to drop in and say hello to me? Why at the drop of a hat he will try to sell me his entire output, lock, stock and barrel!

But in all seriousness, the purchasing agent and the salesmen have mutual responsibilities to each other and to their firms to the end that good relations be maintained.

Recently I have noted a pessimistic note coming from some of the younger men on the road. Some of them are really having to sell for the first time in their lives, and some are getting blue. I have noted their many reasons given for their feeling. But salesmen who sing the blues, shouldn't. Pessimistic announcements by sales or sales executive groups, or by buyers, as to the future of business can be very disastrous. So, wherever it is possible and is justified, optimism and confidence should be expressed. Business is not going to hell—business is just going through hell. Good news about business should be broadcast.

CUSTOMER SERVICE———I have touched on two sides, the purchasing agent and the salesman, of this "let's-get-together" triangle. Now I would like to close the triangle by adding the third and a most important side. We have accepted, far too easily and too literally, the principle that cooperation is a simple, two-way proposition. It now appears that it takes three to make it work successfully. The party of the third part is the organization which must stand behind the salesman, and back him up with customer service.

Take for example the simple case of the salesman who has sent in an order that was won in fair competition. The order is valid when accepted by the home office. This is nothing new. We all do business on that basis from time to time, and it is a common practice. But, does the home office acknowledge the order? Must the buyer repeatedly follow up to see if he is going to get his material? Does he have to wait for delivery before he knows if his order is acceptable or not? What happens if the goods are not shipped? Does your acknowledgment, when it arrives, carry a definite and *dependable* shipping date? Are the terms of the sale in accordance with those under which the order was taken? If something happens to change the seller's plans for shipping, does he notify the buyer as soon as it is known?

This is only one phase, and probably the simplest case where faulty cooperation may be in evidence. But let us complicate the situation a bit. Suppose your sales representative, as a result of several interviews and negotiations, has agreed to certain special terms or special handling of the order. In his judgment, it is a legitimate request involving no major issue in policy on significant concession on the part of the seller. It is simply a matter of adjusting a service to a need, and by so doing he placed himself in a competitive position which resulted in his getting the order for his house. How many times are such simple requests ignored and/or brushed off with the curt explanation, if there is an explanation, that such is contrary to trade practices?

Then there is the matter of small orders, which, of course, is an eco-

nomic liability for both the buyer and seller. But by their working together, many of these things may be ironed out to the point where they may be eliminated altogether. But what about normal orders that come in and the shipper proceeds to part ship in small lots, creating a file full of back orders, and necessitating extra handling of invoices, orders and accounting problems?

These problems, and others like them, are recognized by buyers all along the line, and by a lot of salesmen whose unfortunate lot it is to try and explain them. But are they a chief concern of executives and management, those men who guide the ultimate destinies of their respective companies? The point in bringing this matter up at this time is that there is one area that is ofttimes overlooked in building good business relations. That area is the management of administrative policy, and the performance in handling the details in the customers requests and orders, and the follow through, without which even the best of salesmanship cannot help but result in dissatisfaction and irritation.

Product, price and personality are all right and may land in order, but unless your company is easy to do business with, it will not guarantee re-ordering nor good relations thereafter.

Purchasing agents are constantly trying to educate salesmen in the way they would have their own accounts handled. Salesmen, for the most part, try to cooperate. Salesmen have been known to battle the home office just as hard as they battle an antagonistic buyer for a good account, this being done in an effort to get the home office to follow through with adequate handling, cooperation, and efforts to build better relations between his house and the buyer. But with all due respect for this laudible effort on the part of the salesman and the buyer, it is a responsibility that belongs to neither of them, but to the administration within the company itself.

Life is pretty complex in the business world today. Pressure is on top management, and that pressure is passed on down the line until we are all enveloped in it. Nerves become frayed and sometimes tempers flare, and, of course, mistakes are made. But constant training along these lines will ultimately pay off.

Constant training along ethical lines is just as important as training along other business lines. The constant broadening of man's areas of knowledge becomes an obligation not only to himself, but to his company; yes, even to his country.

I believe it can be said with confidence and pride that the business men of America have accepted the challenge of rising standards of professional competence and are working conscientiouly for better public relations. The work of sales organizations, purchasing organizations, and sales executives clubs; your national, state and district organizations; the excellence of your trade papers; the rise of an obscure individual to executive level in American corporations all testify to this fact. The quality of your meeting here has been further evidence.

For the privilege of having been guest observer and participant on this occasion, I am sincerely grateful.

Scouring Grease Wools

(Concluded from page 156)

cost of the electrolyte, and there is an additional control problem as well as the danger of equipment corrosion.

CURRENT DEVELOPMENTS ——Several factors have contributed to the adoption of the neutral process by the wool-scouring trade. The process is economical and produces a loftier, whiter wool. Much time and effort has been devoted to the process in the laboratories of detergent manufacturers. A very important factor has been the laboratory and plant tests carried out by progressive wool-scouring plants. New wool-scouring processes are being studied, however, and brief mention can be made of developments to be expected in the months ahead.

The neutral-scouring process requires higher temperature than the older alkaline processes. This results in greater steam consumption and may cause uncomfortable working conditions in the scouring room. It follows that a neutral-scouring process effective at lower temperatures is desired. New nonionic detergents may be developed to meet this need.

Use of solvents, such as butyl alcohol, in the scouring process has been studied (7). Additional work on this approach may result in new scouring procedures.

The grease recovered from the neutral-scouring process is darker in color than that from alkaline scouring. This disadvantage is offset from an economical standpoint by the fact that neutral scouring results in a greater grease recovery by conventional methods than alkaline scouring. Both the quantity and quality of the recovered wool grease are important and are being given consideration when screening new scouring techniques. Some plants are confronted with stream-pollution problems and must pay particular attention to the efficiency of the grease-recovery system.

The neutral-scouring process lends itself well to continuous scouring and dyeing. This recent development has been of particular interest to the carpet trade.

SUMMARY AND CONCLUSIONS

A new, neutral process has been developed for scouring raw wool based on an alkylphenol-type nonionic detergent. Numerous plant trials have substantiated laboratory tests. The neutral-scouring process is adaptable to existing wool scouring equipment and is economical. Neutral scouring requires somewhat higher temperature than the older alkaline-scouring processes. A nonylphenol-base detergent containing 10.5 moles of ethylene oxide produces optimum results.

Wool scoured by the neutral process is whiter and more lofty. Furthermore, this process eliminates any possibility of alkali damage to wool. The neutral process can be used for coarse carpet wools, fine wools, and specialty fibers, such as mohair, camel hair and cashmere.

Although the neutral-scouring process has been widely adopted in the trade, new scouring procedures are under development. The neutral process is particularly well suited to continuous scouring and dyeing.

ACKNOWLEDGMENT

The author wishes to express appreciation to G M Gantz and W R Brandt for their assistance in preparing this paper.

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Activities of the Local Sections

Metropolitan

UNDER its newly adopted name, the Metropolitan Section (formerly the New York Section) held its first meeting on February 7, 1958 at the Sheraton McAlpin Hotel, New York, NY, with Chairman Donald E Marnon, Berkshire Color & Chemical Co, presiding.

Henry E Millson, Organic Chemicals Div, American Cyanamid Co, delivered a talk entitled, "Microscopical Studies with the High-Temperature Microdyeoscope," which he illustrated with numerous slides.

Chairman Marnon announced that Michael F Costello, Jacques Wolf & Co, would serve as chairman of the Section's 1958 Annual Outing and Golf Tournament, slated for June 6 at the North Jersey Country Club, Wayne Township, NJ.

The next meeting of the Section will be held April 18 at Kohler's Swiss Chalet, Rochelle Park, NJ.

DELAWARE VALLEY SECTION "OLD TIMERS NIGHT"

December 6, 1957 • Kugler's Restaurant • Philadelphia, Pa.

(See Report—P58, January 27th issue)

Charter members Percival Theel (2nd left), Philadelphia Textile Institute, and Russell W Hunt (3rd left), Franklin Process Co, chat with William S Sollenberger (left), current Delaware Valley Section chairman, and Donald W Robinson, outgoing chairman, during "Old Timers Night" meeting.

DELAWARE VALLEY SECTION "BRASS"—Delaware Valley Section officials for 1958 discuss plans at the Section's "Old Timers Night" meeting of December 6th. (L to r): William S Sollenberger, American Viscose Corp, chairman; L Kevin McChesney, Leatex Chemical Co, vice chairman; Ernst W Empting, Verona Dyestuffs, secretary; Clarence A Seibert, Scholler Bros, Inc, treasurer.

PAST CHAIRMEN—Past chairmen of the Delaware Valley Section in attendance at the recent "Old Timers Night" meeting included:

Seated (l to r): Edward C Diehl, Ankokas Dyeing & Processing Co; John F McCoy, Edgewater Dyeing & Finishing Co; James Dixon, retired; William Ebersold, James Lees & Sons Co; Arthur M Gordon, Martin Fabrics Corp; and Ange E Raimo, John Campbell & Co, Inc

Standing (l to r): Donald W Robinson, Para-Chem, Inc; Thomas H Hart, Hart Products Corp; Frederick V Traut, Globe Dye Works Co; Robert E Sullivan, Anchor Thread Co; Harold B Dohner, Amalgamated Chemical Corp; and Richard B Stehle, Allegheny Dye Works

Piedmont

THE Piedmont Section met January 25, 1958 at the Clemson House, Clemson, SC, for its regular Winter Meeting, which was attended by 280.

The Research Committee met in the morning with Fred Fortess presiding. Progress reports on the various projects of the Committee and outlines of further work to be done were presented by the heads of four active subcommittees: Neal Truslow, Vincent B Wright, A T Clifford, and Luther B Arnold. A fifth subcommittee, newly formed, is headed by Victor S Salvin.

The officers' luncheon was held at noon, at which time Section business was discussed.

The afternoon technical session featured two papers: "The Application of Radio-active Chemicals to Textile Problems" by W T Rainey of Clemson College, and the Piedmont Section's 1957 Intersectional Contest first-prize-winning paper "Relation of the Effect of Resins on Light Fading and the Tendering Action of Photosensitive Vat Dyes." The latter paper was presented by L B Arnold, who delivered the paper originally at the Boston Convention.

At the evening banquet, attended by 152 members and guests, M B Eubanks, director of purchasing and traffic for Riegel Textile Corp, spoke on "Three Sides to the Public Relations Triangle."

Mid-West

THE Mid-Winter Meeting of the Mid-West Section, held at the Bismarck Hotel, Chicago, Ill, February 15, attracted eighty-one members and guests, including twelve representatives of the Mid-West Woolen Manufacturers Association. Chairman Jack G Kelley, E I du Pont de Nemours & Co, Inc, presided.

Speakers at the meeting were Gerald Laxer, director of the Department of Science and Industry, The Wool Bureau Inc, New York, NY, who spoke at the afternoon session, and H F Clapham, assistant technical manager, Dyes & Chemicals Div, E I du Pont de Nemours & Co, Inc, who spoke at the evening session. Dr Laxer discussed three major research projects on wool, which are now underway under the sponsorship of The Wool Bureau, Inc. Mr Clapham discussed recent developments in dyes and dyeing techniques for wool.

Richard R Frey, assistant secretary, AATCC, spoke briefly regarding activities at National Headquarters at Lowell, Mass.

Chairman Kelley announced the formation of nine committees, the chairmen of which follow: *Technical* — Lee Johnston; *Nominating* — John Eich; *Corporate Membership*— J L McGowan; *Stream Pollution Abatement*—James Crane; *Program*—Frank Stover; *Scholarship*—E I Stearns; *Publicity*—Bernard Isenogle; *Outing*—Roger G Carr; *Auditing*—Erwin Sindt.

Elliott Morrill, chairman of the 1958 Convention, to be held Oct 30-Nov 1 in Chicago, reported on the meeting held by the Convention's Executive Committee on February 14th at the Conrad Hilton Hotel, site of the Annual Meeting.

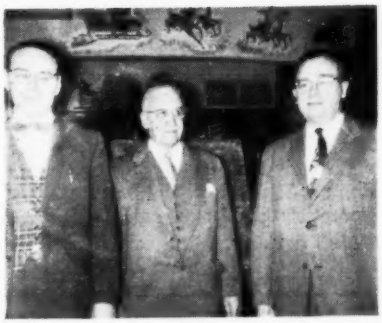
It was voted that the Section's annual election of officers would be held at the time of the outing in June, and that, in view of the fact that the National Convention would fall on the week wherein the Section would normally hold its Autumn Meeting, the Autumn Meeting be cancelled.

The Section will meet next at the Netherland Hilton Hotel, Cincinnati, O, on April 19th to hear a presentation by personnel of B F Goodrich Chemical Co on the Company's recently renamed dinitrile fiber, Darvan.

WESTERN NEW ENGLAND SECTION MEETING
December 13, 1957
Rapp's Restaurant
Shelton, Conn

(Photos courtesy of A N Henschel)

The "man of action" at the right is Ernest R Kaswell, Fabric Research Laboratories, Inc, AATCC vice president (New England Region). Others at the head table during the Western New England Section's December 13th meeting are (l to r): Geo O Linberg, Synthron, Inc, president, AATCC; Thomas J Gillick Jr, American Felt Co, chairman, Western New England Section; and Fernand Schlaeppi, Ciba Co, Inc, who spoke on the subject, "Some Principles of Fabric Reactive Dyes and Practical Experience in their Application".



J Edward Lynn, national councilor from the Western New England Section, poses with Ernest R Kaswell, AATCC vice president (New England Region), and Geo O Linberg, AATCC president, during December meeting of the Section at Rapp's Restaurant, Shelton, Conn

MID-WEST SECTION MID-WINTER MEETING
Febraury 15, 1958 • Hotel Bismarck • Chicago, Ill

HEAD TABLE (l to r): Frank H Gurry, Aurora Bleachery, Inc, treasurer, Mid-West Section; Warren B Broadbent, Geigy Dyestuffs, acting secretary; Jack G Kelley, E I duPont de Nemours & Co, Inc, chairman; H F Clapham, E I duPont de Nemours & Co, Inc, evening speaker; James L McGowan, Morgan Dyeing & Bleaching Co, vice chairman

(L to r): Bernard Isenogle, Aurora Bleachery, Inc, chairman, Mid-West Section Publicity Committee; Frank S Stover, American Aniline Products, chairman, Program Committee; Elliott Morrill, The Best Foods, Inc, AATCC vice president (Western Region); Robert Turner; Edwin I Stearns, American Cyanamid Co, chairman, Scholarship Committee

Membership Applications

SENIOR

Irving A Berstein—Tech director, Controls for Radiation, Inc, Cambridge, Mass. Sponsors: K H Barnard, A T Clifford. (NNE).

Edwin H Beach — Chemist, Tech Service Dept, Arnold Hoffman & Co, Inc, Providence RI. Sponsors: R Thornton, B J Garceau. (RI).

Arthur Bibeau — Plant chem & quality control head, American Felt Co, Glenville, Conn. Sponsors: E L Johnson, T J Gillick Jr. (WNE).

John Brandiff—Chemist, Armour & Co, Chicago, Ill. Sponsors: P B Mack, J C Sherrill. (MW).

Francis W Burke—Foreman printer, Cranston Print Works Co, Webster, Mass. Sponsors: G O Linberg, A S Jones. (RI).

Benjamin Caskey—Head dyer, Burlington Industries, Hurt, Va. Sponsors: J P Franklin, S G Williams. (P).

James B Connor—Divisional supt, dye & finish, Dominion Textile Co Ltd, Magog Print Works, Magog, Que, Canada. Sponsors: W R Tornquist, F Collette.

Lillian Fecko — Dyer, Botany Finishing Co, Passaic, NJ. Sponsors: T Hirsch, E D Lind. (Met).

James S Hays Jr—Overseer, bleaching & finishing, Mission Valley Mills, New Braunfels, Texas. Sponsors: C M Moor, F W Smith Jr. (SC).

Curtis N Housch—Overseer, Crystal Springs Bleachery, Chickamauga, Ga. Sponsors: H P Loveless, L L MaDaris. (S).

James G Locke — Canadian sales mgr, Woonsocket Color & Chemical Co, Montreal, Que, Canada. Sponsors: D E York, C R Teichgraber.

Charles Malone—Colorist, Princeton Knitting Mills, Watertown, Conn. Sponsors: T J Horan, A W Goodwin. (WNE).

Kikuzi Ozaki—President, Ozaki & Co, Ltd, Japan. Sponsors: L Fusser, G E Neisser

William T Rainey — Assoc prof, textile chem & dye, Clemson College, Clemson, SC. Sponsors: J Langston, J Lindsay. (P).

Edward R Rand — General mgr, Dalebrook Finishing Co, Hohokus, NJ. Sponsors: J M Schandler, W Wald Jr. (Met).

George W Smiley — Chief chemist, Magog Print Works, Magog, Que, Canada. Sponsors: W R Tornquist, F Collette.

Howard W Wilson — Dyer, Woonsocket Dyeing Co, Inc, Woonsocket, RI. Sponsors: J E Dubois, M A E Delys. (RI).

ASSOCIATE

Donald E Bailey—Colorist, Sidney Blumenthal & Co, Inc, Caromount Div, Rocky Mount, NC. Sponsors: S D Bennett, D W Adams. (P).

Grover C Owens—Chemist, Raeford Worsted Corp, Raeford, NC. Sponsors: H E Millson, E J Glaeser. (P).

George W Sarti—Salesman, Metro-Atlantic Inc, Greenville SC. Sponsors: H Papini, J C King. (P).

Hidesboro Tanaka—Sub mgr, Chem Dept, Mitsubishi Shoji Kaisha, Ltd, Japan. Sponsors: L Fusser, G E Neisser.

STUDENT

William J Allred, Melvin A Caldwell, James C Hunter, Donald H Logue, and Thomas L Williams — Students, Clemson College, Clemson, SC. Sponsor: J Lindsay. (C).

R William Bartsch, Allen Carlson, Donald A Gallo, John C Lipsey, and George Zaloom — Students, Fairleigh Dickinson Univ, Rutherford, NJ. Sponsor: S Tessler. (Met).

Jean B Letourneau—Student, Philadelphia Textile Institute, Philadelphia, Pa. Sponsor: W H Hughes. (PTI).

Monica C Meagher—Graduate student, Purdue Univ, Lafayette, Ind. Sponsor: R W Padgett. (MW).

Frederick Warlick—Student, North Carolina State College, Raleigh, NC. Sponsor: H A Rutherford. (NC).

TRANSFER TO SENIOR

John L Waldo—Asst dir, dyestuff sales, Allied Chemical & Dye Corp. Sponsors: W A Holst, H B Fenn Jr. (Met).

Armand Dimeo—Plant mgr, Rebel Dyeing Corp, Gloversville, NY. Sponsors: E A Chevrette, R J Moyer. (HM).

Louis J Provenza—Asst lab supervisor, National Aniline Div, Allied Chemical & Dye Corp. New York, NY. Sponsors: W G Darrow, P L Oertel. (Met).

AATCC Calendar

COUNCIL
May 23 (Philadelphia, Pa); Sept 19 (Charlotte, NC); May 1959 (Montreal, Canada)

NATIONAL CONVENTIONS
Oct 30-Nov 1, 1958 (Hotel Conrad Hilton, Chicago); Oct 8-10, 1959 (Sheraton Park and Shoreham Hotels, Washington, DC); Oct 6-8, 1960 (Sheraton Hotel, Philadelphia, Pa); September 28-30, 1961 (Buffalo, NY)

DELAWARE VALLEY SECTION
March 7, April 12 (Ladies Night), May 23 (Outing), Sept 12 (Wilmington Meeting), Oct 17, Dec 5

HUDSON-MOHAWK SECTION
Mar 28 (Jack's Restaurant, Albany, NY); May 16 (Ladies Night, Chelsea House, Tribes Hill, NY); June 20 (Annual Outing, Antler's Country Club, Ft Johnson, NY)

METROPOLITAN SECTION
April 11 (New Jersey area)

MID-WEST SECTION
April 19 (Netherland Hilton Hotel, Cincinnati, O); June 13-14 (Outing—Browns Lake Resort, Burlington, Wis)

NIAGARA FRONTIER SECTION
Apr 11 (Joint meeting)

NORTHERN NEW ENGLAND SECTION
Mar 28 (Commander Hotel, Cambridge, Mass); May 9 (Lowell Technological Institute, Lowell, Mass); Sept 12 (Outing—Wachusett Country Club, West Boylston, Mass); Oct 17 (QM Research & Development Ctr, Natick, Mass); Dec 5 (Hotel Vendome, Boston, Mass); Jan 16 (Colonial Club, Lynnfield, Mass)

PIEDMONT SECTION
Apr 25-26 (Washington Duke Hotel, Durham, NC); June 6-8 (Outing—Grove Park Inn, Asheville, NC); Sept 19-20 (Hotel Charlotte, Charlotte, NC)

RHODE ISLAND SECTION
Mar 21 (Providence Engineering Society, Providence, RI); Apr 25 (Students Night—Bradford Durfee College of Technology, Fall River, Mass); June 13 (25th Annual Outing—Wannamoisett Country Club); Sept 26 (Management Night—Warwick Country Club); Oct 23 (Providence Engineering Society); Dec 4 (Annual Meeting—Johnson's Hummocks Grille, Providence)

SOUTH CENTRAL SECTION
Mar 29 (Hotel Patten, Chattanooga, Tenn); May 30-31 (Summer outing—Hotel Greystone, Gatlinburg, Tenn); Sept 13 (Hotel Patten, Chattanooga, Tenn)

SOUTHEASTERN SECTION
Apr 19 (Alabama Polytechnic Institute, Auburn, Ala); June 6-7 (Summer outing—Radium Springs Lodge, Radium Springs, Ga); Sept 13 (Columbus Country Club, Columbus, Ga); Dec 6 (Atlanta, Ga)

WESTERN NEW ENGLAND SECTION
Mar 21 (Rapp's Restaurant, Shelton, Conn); May 16 (Ladies Night—Rapp's Paradise Inn, Ansonia, Conn); June 13 (Outing—Wallingford Country Club, Wallingford, Conn); Sept 26 (Hartford, Conn); Oct 24 (Annual Meeting—Rapp's Restaurant, Shelton, Conn); Dec 5 (Rapp's Restaurant, Shelton, Conn)

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PO Box 352, South Yarmouth, Mass

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Technical Manager .....GEORGE J MANDIKOS
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Research Associates .....GLEN M KIDDER, HARLAN E GLIDDEN

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STUDENT CHAPTERS

Alabama Polytechnic Institute, Bradford Durfee College of Technology, Clemson College, Georgia Institute of Technology, Lowell Technological Institute, New Bedford Institute of Technology, North Carolina State College, Philadelphia Textile Institute, Rhode Island School of Design

THE SECOND EDITION
of
THE COLOUR INDEX
IN FOUR VOLUMES
IS NEARING COMPLETION

Volumes 1 and 2 are being distributed to prepaid subscribers.

VOLUME THREE

is in transit from England and will be delivered to subscribers in March 1958

Volume 4, completing the set, will be ready in the Fall

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Your prepaid subscription received promptly will insure complete delivery this year of this tremendously valuable work on the free world's dyestuffs and pigments in commercial use. Published by the Society of Dyers and Colourists (British) and the American Association of Textile Chemists and Colorists, these four volumes represent ten years of intensive work in assembling and editing the data. They include approximately 3000 pages of application and fastness properties of coloring matters as furnished by world manufacturers, chemical and structural information, characteristic reactions, index of products and trade names, fastness tests and rating methods, new and old COLOUR INDEX NUMBERS, Schultz and AATCC prototype numbers and a Hue Indication Chart.

Further Particulars from

American Association of Textile Chemists and Colorists

PO Box 28, Lowell, Massachusetts

News of the Trade

Scholler Bros, Inc plant at Atlantic County, NJ

Scholler Bros New Jersey Plant in Operation

A new, streamlined, fully automatic manufacturing unit, which has been added to the production-research facilities of Scholler Brothers, Inc got underway last month in Atlantic County, NJ.

Covering more than five acres of ground, this plant has been declared to be one of the most modern of its kind in the world. Many of the physical facilities, which normally would be above ground, are here deeply buried beneath the surface for purposes of safety and efficiency. In addition, an area of tanks for manufacture and storage is also underground.

Special equipment at this facility reportedly permits the manufacture of all types of resins for use in the textile and other fields. It will also greatly expand Scholler Brothers' research into areas of carpets and tufted textiles as well as other related fields within the broadened scope of the company's projected activities.

The addition of the New Jersey research and manufacturing plant will not affect the operations of Scholler Brothers plants in Philadelphia and Canada, company officials emphasized. Rather, they pointed out, it will greatly augment the abilities to better serve the fields with which Scholler Brothers has always been identified. It is reported that the addition of the New Jersey plant will, in fact, broaden the company's activities into an area of research that the Philadelphia laboratories of the company did not allow.

Kiesling-Hess Finishing Co Formed

Announcement has been made of the formation of the Kiesling-Hess Finishing Co, Inc, Philadelphia, to handle stain-resistant and flameproof finishing for decorator fabrics in small yardages for decorator and fabric houses formerly handled by the Schwarzwaelder Company of that city.

Fred Hess, Jr, assistant to the president, and Charles H Kiesling, vice president, of the Schwarzwealder Company will direct the activities of the new corporation, which initially will offer Dow Corning Syl-Mer silicone finishing, 3M's Scotchgard stain-repeller finishing and flameproofing.

Mr Hess stated that the company plans continued expansion of its service to include all new processes to improve the beauty and utility of decorator fabrics.

Shell Chemical Shipping H_2O_2 from New Plant

Shell Chemical Corporation has begun shipping hydrogen peroxide in tank car quantities from its new plant at Norco, La.

The peroxide, available in several concentrations, is made by a new organic process.

As a prime supplier of hydrogen peroxide located near the heart of the cotton bleaching industry in the South, Shell considers the new plant an important development in the Gulf Coast chemical industries serving textile manufacturers.

Wyandotte's Pyrazine Unit on Stream

Wyandotte Chemicals Corp has just placed on stream the first unit for the production of methylpyrazine and 2,5-dimethylpyrazine. These new facilities complement Wyandotte's existing plant for the production of 2-methylpiperazine and 1,4-bis-(2-hydroxypropyl)-2-methylpiperazine (DHP-MP) at Wyandotte, Mich.

Wyandotte introduced the substituted pyrazines and piperazines to the chemical industry in February, 1955. Since that time the technology of pyrazine and piperazine chemistry and the demand for these products has grown steadily. Wyandotte's answer to this growth is twofold: new production facilities and the publication of a new guide to the reactions and applications of the pyrazines.

The booklet is a survey of the most recent and significant literature in the field of pyrazine chemistry. Of particular value will be the application information covering data on the preparation of dyes from the pyrazines.

Foreign Technical Info Center

Secretary of Commerce Sinclair Weeks recently announced new measures to increase scientific knowledge through establishment of a Foreign Technical Information Center within the US Department of Commerce.

To finance prompt action on the new project, the Department is requesting a special appropriation of $300,000 (contained in the supplemental request transmitted to the Congress by the President) to initiate the program. In addition, the President's budget for 1959 includes $1,250,000 for the Department's Foreign Technical Information program.

The new program will set up a central clearinghouse in the Commerce Department's Office of Technical Services, headed by John C Green. The Center is to collect, evaluate and distribute valuable foreign scientific and technical literature for the use of American scientists and engineers.

VOLUME 3
COLOUR INDEX
IS HERE.
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Victor R Jensen (right), director of the customer service laboratory, is shown matching textile shades in the newly-opened regional office of The Hilton-Davis Chemical Co, in Trenton, NJ.

Hilton-Davis Opens New Textile Service Branch

A new customers' service and sales office serving the textile industry has been opened in Trenton, NJ, by the Hilton-Davis Chemical Company, Cincinnati, Ohio.

Located at 942 Prospect Street, the combined service laboratory and sales office is the fourth such operation established by Hilton-Davis. The others are in Cincinnati, Greenville, SC, and Providence. All four branches supply a complete line of naphthols, fast color bases and salts, stabilized azoic printing compounds, and pigment printing colors of the water-in-oil and oil-in-water emulsion types.

Willard S Sharp has been appointed manager of the new Trenton branch office. He has been manager of textile sales in the mid-Atlantic states since joining the company in 1955.

Victor R Jensen has been placed in charge of the Trenton sales service laboratory. Before joining Hilton-Davis, he was a textile colorist for General Dyestuff Corp.

Jensen

49th Meeting, AOCS

April 21-23 will be the dates of the 49th annual meeting of the American Oil Chemists' Society, to be held in Memphis, Tenn, at the Peabody hotel, with Allen Smith of the Perkins Oil Company as general chairman and S J Rini of the HumKo company as program chairman. A special feature of the meeting will be a symposium on tall oil, arranged by J P Krumbein, Newport Industries Co, Pensacola, Fla.

Next on the Society calendar will be the 1958 short course on soaps and syndets (synthetic detergents), scheduled for July 14-18 at the Princeton Inn, Princeton, NJ, with Foster Dee Snell of the Foster D Snell Laboratories, New York, as general chairman.

W A Peterson, Colgate-Palmolive Co, Jersey City, NJ, will be chairman of the first day, Monday, and subjects will include alkylates, fatty alcohols, sulfonation and sulfation, theoretical and practical aspects, and a dinner topic on the changing scene in soaps and syndets.

Tuesday's chairman will J L Hale, Swift and Company, Newark, NJ; subjects will be ethylene oxide condensation, amine condensates, builders and other adjuncts of syndets, fluorescers, with syndets in sewage as the general topic.

Third day chairman will be Donald Price, New York consultant, and subjects will be specialty syndet structures and types, application of specialty syndet structures, glycerine production, and glycerine application with dermatological aspects of soaps and syndets as the dinner topic.

Thursday's chairman will be Morris Mattikow of Refining Uninc, New York. Subjects will be saponification stressing the newer methods, splitting of fatty acid, spray drying, and analytical application stressing the newer methods, and the dinner topic will be the economics of soaps and syndets.

On the final day Jay C Harris, Monsanto Chemical Co, Dayton, O, will be chairman. Subjects will be textile uses, general detergency, evaluation in metal processing, and general properties.

Inquiries about the course should be sent to the American Oil Chemists' Society at 35 E Wacker Drive, Chicago 1, Ill.

Textile Engineering Conference at NC State

A comprehensive conference on textiles is scheduled for March 20-21 at North Carolina State College in Raleigh, NC. Sponsored by the Textile Division of the American Society of Mechanical Engineers, in cooperation with the School of Engineering and the School of Textiles of North Carolina State College, the Textile Engineering Conference will have as its theme "Cost Control Through Engineering."

The banquet, on March 20, will have as its guest speaker William H Ruffin, president of the Erwin Mills.

Research Dept Established at Clemson School of Textiles

A department of research, under the direction of William T Rainey, professor of textile chemistry and dyeing since 1948, has been established in the School of Textiles at Clemson College.

The program, will be the forerunner of accelerated sponsored research on a college-wide basis. The department was approved by the Board of Trustees in October.

Dr Rainey, recently on leave from the college to participate in research at Oak Ridge National Laboratories, will draw on the special talents of textile school faculty, and faculty members of the college as well. A staff of technicians is proposed for routine processing and testing work.

Sponsors will bear the cost of the applied Clemson-based research. Research problems will be presented by both industry and the college. When funds and personnel are available, the research department will initiate projects of its own. The program will become self-supporting.

The school's qualifications for conducting the work are underscored by modern, diversified equipment, especially in the vital areas of textile chemistry and finishing.

The new department will be under the joint administration of the School of Textiles and Office for Development, headed by Vice President R C Edwards.

• NEW PRODUCTS AND DEVELOPMENTS •

New Developments in LQ600 Valves Highlighted at Arrow Bleachery

The outstanding performance reported for Lunkenheimer LQ600 Bronze Globe Valves, which have been in continuous service at Cluett, Peabody & Co's Arrow Bleachery Plant at Waterford, NY, for over 26 months without any maintenance, has been attributed to a combination of two new valve developments—a new seating metal patented under the name "Brinalloy", and the flat-seat design of the valve.

Brinalloy is said to be so resistant to wear and corrosion that it can be fused permanently into the valve for its entire life. The Brinalloy seats and discs in the LQ600 Bronze Globe Valves manufactured by the Lunkenheimer Co of Cincinnati, O, do not require replacement, renewing, or regrinding, it is claimed.

Lunkenheimer LQ600 Valves installed in steam feed throttling service for water heating in the continuous bleaching range cloth washer at the Arrow Bleachery Plant of Cluett, Peabody & Co, Inc.

At Arrow Bleachery, LQ600 Valves control the steam feed for water heating in the continuous bleaching range cloth washer. They also control the starch boiling with high-pressure steam and must provide positive shutoff as overboiling is hazardous and will spoil the mix. Open-and-close cycles for the valves range from 12 to 20 per day. The same throttling service with former valves reportedly called for servicing or replacing because of wire-drawing within a few months.

Ahcovel T; Ahcovel P Series

Introduction of two new cationic substantive softeners, one of them available as a concentrate, has been announced by Arnold, Hoffman & Co, Inc, Providence, RI. They are designated as Ahcovel T and the Ahcovel P series.

Ahcovel T is described as a versatile textile softener which performs effectively on cotton, viscose and acetate rayons, nylon, Orlon, Dacron, etc. Developed especially for use with cyclic urea resins, it is said to be of merit in both pure and resin finishes. When used with resins, Ahcovel T reportedly imparts lubrication and softness and higher tear strengths. No decrease in crease resistance is reported, nor is any danger of chlorine retention damage due to the presence of Ahcovel T. Resistance is excellent to yellowing at normal processing and curing temperatures, and finished fabrics will not develop odor on storage of the goods, it is claimed.

Among outstanding characteristics of Ahcovel T cited by the manufacturers are the fact that it is a pourable, fast-dissolving, readily usable paste; its low forming properties; compatibility with most resin catalysts; excellent softening action for synthetic and natural fibers; high resistance to scorching and yellowing; increased tear strength of treated fabrics; high substantivity; good durability to washing; imparting of antistatic properties to hydrophobic fibers.

Ahcovel T reportedly can be poured or pumped and can be added just as received to water or resin baths which are 120°F or warmer, without previous pasting or diluting.

In the new Ahcovel P series, according to Arnold, Hoffman, are found many of the desirable qualities and characteristics inherent in the long established and widely accepted Ahcovels G and A. In the new softeners, typical Ahcovel quality is available in a price range consonant with that of the less expensive, non-substantive softening agents, it is stated.

Said to be durable and resistant to scorching or discoloration due to effects of heat, the Ahcovel P softeners reportedly impart the pleasing soft hand which is important in processing as well as in fabric appeal. The series is specifically recommended by Ahco for application to cotton or viscose rayon, either as pure finishes or as plasticizers in resin formulations. In resin applications, using Ahcovel P, resin-catalyst-softener compatibility is said to be adequate under normal operating conditions and approaches that obtained with the more expensive Ahcovels. Increase in tear strength of resin-treated fabrics approaches that obtained with use of Ahcovel G.

Ahcovel P is described as a pourable paste which is readily dispersible in water at 90°-100°F. Ahcovel P Conc is described as a 100% (approx) concentration of Ahcovel P, which permits a considerable savings to finishers who are equipped to do their own pasting.

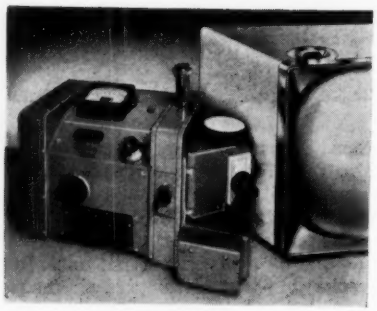
Technical circulars detailing properties and characteristics of Ahcovel T and the Ahcovel P series are available from Arnold, Hoffman.

Artisil Direct Blue Green 3G; Pyrazol Fast/Cuprofix Turquoise FBL

Suitable for coloring the newer synthetic fibers, Artisil Direct Blue Green 3G, a disperse dye, is the latest dyestuff released by Sandoz, Inc. It reportedly offers a considerable improvement in brightness of shade, compared to the best previous bluish green in a disperse dye. This homogeneous dyestuff is the closest to a true green shade yet to appear in this class. Fastness to sunlight is said to be extremely good on acetate and nylon. Stable to heat, Artisil Direct Blue Green 3G is recommended by Sandoz for nylons and triacetates which will be heat treated.

A new direct turquoise, Pyrazol Fast/Cuprofix Turquoise FBL, is being recommended by Sandoz for cotton and viscose applications requiring a very high degree of fastness to washing, acid or gas fading, and perspiration. Brightness of shade and stability to acid or gas fading are among the advantages claimed for this dye. Good solubility reportedly makes it suitable for application by padding. It is said to be of value, also, for dyeing silk. Fastness to light is very good, and wetfastness is improved by aftertreatment with Sandofix WE or UF, alone or in combination, it is stated.

Leaflet number 1307, describing Pyrazol Fast/Cuprofix Turquoise FBL, may be seen on request made to the nearest district office of Sandoz, Inc.



IDL Color-Eye

Design Change in Color-Eye

A new design change in Color-Eye, Instrument Development Laboratories' portable electronic colorimeter with abridged spectrophotometer, reportedly makes precision color control possible on large flat surfaces. It is claimed that, now, one can place Color-Eye directly against large flat surfaces and measure color differences or detect color deviations from established standards just as accurately in the plant as in the laboratory.

Color-Eye reportedly will handle all kinds of materials and will measure color differences in both reflected and transmitted color. On the production line, it saves time, reduces rejects and takes the guesswork out of color quality control, it is claimed. It is said to rapidly reduce color to numerical values for use in: setting up color standards, detecting color variations in raw materials, detecting drift in both the sample and production color, bring production colors within acceptable tolerances and to reduce or eliminate metamerism.

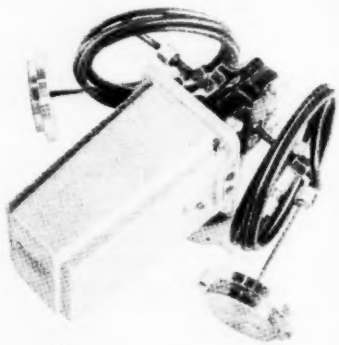
For more specific information write for IDL's new Color-Eye brochure, available from the company at 67 Mechanic St. Attleboro, Mass.

Taylor 205T Volumetric Differential Pressure Transmitter

The Taylor 205T Volumetric Differential Pressure Transmitter was designed for the purpose of simplifying difficult flow and liquid level measurements, ie, corrosive fluids, liquids that "jell" when not in motion, colloidal suspensions and slurries. It provides a standard instrument which is said to completely eliminate a wide variety of costly special installations and the maintenance of winterized lead lines ordinarily required between transmitter and process. The 205T is said to be equally effective with bleach or dye liquor solutions.

The entire sensing system, including the two sensing elements, their capillaries, and the differential pressure sensing diaphragm to which they connect, is factory-fllled with silicone compound and permanently sealed. These components are built-in, integral parts of the primary (or differential pressure sensing) portion of the 205T.

Two types of sensing unit assemblies are provided: one, for mounting flush with inside of chemical tee for pipe installation, the other, for mounting on a standard 3″ flange. The temperature limit is 300°F at the sensing diaphragms. Pressure limit of the instrument is 1500 lbs. The system is limited only by the flange rating on the primary side. The sensing elements directly contact the fluid in the pipe or tank, at two points, and relay the pressure differential to the secondary portion. Since conventional lead lines are not required, the transmitter can be mounted at



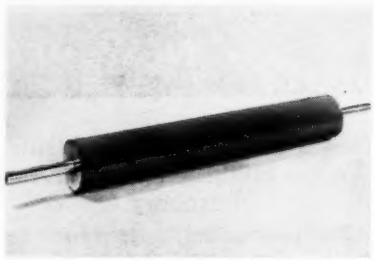
Taylor 205T Volumetric Differential Pressure Transmitter

ground level, with sensing elements overhead. The risk of danger to maintenance personnel is eliminated and the transmitter is free from damage or shutdown caused by corrosion, plugging, etc, it is claimed.

The secondary (or transmitting) portion of the 205T is a mercuryless force-balance instrument patterned after Taylor's 333R Transmitter. This converts the differential measurement to a 3-15 psi pneumatic output signal, which goes to a suitable receiver and/or controller.

The 205T reportedly incorporates simple range and zero adjustment, effective damping against pulsations and vibrations and complete overrange protection in an accurate, sturdy and dependable means of measurement.

Request Bulletin 98281 from the Taylor Instrument Companies, Rochester 1, NY.



Luzerne-processed Rigid PVC-covered roll

Luzerne Process

A new process recently announced reportedly has made possible the use of Rigid PVC for roll covering.

Economy, versatility and the physical and chemical properties of this plastic are major features claimed for these coverings, which are now being produced and applied in production quantities.

In the controlled "Luzerne process," special PVC tubing is shrunk tightly over new or old rolls to provide a strong mechanical bond.

Bulletin RC 9000 is available from the Luzerne Rubber Co, Trenton, NJ.

New Brominated Compounds for Flameproofing

Michigan Chemical Corp, St Louis, Mich, has announced a series of new brominated compounds used to impart flameproofing and self extinguishing characteristics to textiles and other products where fire resistance is important.

The new products are tetrabromobisphenol-A, tetrabromophthalic anhydride, tris(2-bromoethyl) phosphate, pentabromophenol, and tris(2, 3-dibromopropyl) phosphate.

These products possess the fundamental flameproofing superiority of brominated compounds, which—molecule for molecule—are several times more efficient than their chlorine analogs, it is claimed. This basic advantage is said to permit the use of smaller quantities of the flameproofing additive than would be required with chlorine compounds. As a result, it is reported that there will be less disturbance of the physical properties and appearance of the end product, and less adverse effect on product utility.

The possibility of brominating curing agents, monomers, and basic resins, themselves to achieve a "built-in" flameproofness is a related phase of research and development being carried on by Michigan Chemical, the announcement said.

Testing quantities of the new flameproofing compounds are available.

Si-Ro-Set Process

Development of a process "to produce permanent pleats in all-wool dresses and skirts and permanent knife-sharp creases in men's all-wool trousers which will not come out in the rain, warm soapy water or dry cleaning" was announced recently through The Wool Bureau Inc, 16 West 46th St, New York 36, NY.

Developed in the Geelong, Victoria laboratories of the Commonwealth Scientific and Industrial Research Organization, the process, patented in Australia, is known as Si-Ro-Set. It reportedly has proved successful in tests in several Australian apparel factories and in actual wear trials and is now being licensed to approved firms in that country.

In the process, the garment is sprayed with a weak chemical solution just before the final pressing. The crease is then fixed by steam pressing for 15 seconds. Said to be completely safe for factory application, the process is described as having "no damaging effects on wool and producing pleats and creases that last indefinitely."

Speaking on the importance of the development to the apparel field, Max Schmitt, president of the Wool Bureau, said the new process "offers manufacturers the opportunity to produce permanently pleated wool garments without resorting to the use of fibers which soften and melt with heat. Science has added a long-sought-for performance feature to wool's natural advantages of elasticity, softness, resistance to pilling, long wear, warmth, ability to obsorb moisture without feeling damp and natural fire resistance.

"This process brings us one step closer to the day when we will have all-wool wash and wear garments," he continued. "This is a goal toward which we are working every day in laboratories throughout this country. The Wool Bureau recently embarked on a two-year scientific program at the Harris Research Laboratories in Washington, DC aimed at producing wool fabrics 'engineered' to be washed in the home washing machine without shrinking.

"Under Wool Bureau auspices, Fabric Research Laboratories, Inc, Dedham, Mass, is carrying out research to produce lightweight wool fabrics 'engineered' to have extremely high wrinkle resistance. Through the right combination of engineering principles and chemical processes, such as the permanent pleating technique, scientists throughout the world are now expected to impart even more desirable characteristics to wool fabrics.

"One goal which we expect will be reached soon is the production of wool garments which can be washed and worn with a minimum of 'touching up'."

Colorimetric Titration Kit

The Fisher Electrophotometer and the Fisher Clinical Electrophotometer have been supplemented by an inexpensive, easily installed accessory which is said to enable the operator to perform titrations using colorimetric endpoints without the uncertainties of the human eye.

The new Colorimetric Titration Kit consists of a magnetic stirrer for sample mixing and a hinged lid assembly for introducing a standard or micro buret into the cell compartment. Standard 60-ml and 23-ml cells, and even 100-ml beakers can be used for titrations, it is claimed.

By the proper choice of Electrophotometer filters, the operator can measure the absorbance of the sample during titration. A sudden change in absorbance indicates the endpoint; the exact endpoint is obtained graphically from the intersection of two straight lines on a plot of ml titrant vs absorbance.

The Kit's lid has two openings for burets, centered over the two titration cells when the carriage is in rearmost position. (Openings are closed by snap hole plugs when not in use). Rubber grommets, placed on each buret stem before buret insertion, close off the openings, serve as light seals.

Operation consists of placing sample and stirring magnet in cell, inserting in cell holder, turning instrument and stirrer switches to "On", inserting buret (or burets) in lid, and titrating.

Further information may be obtained by writing to Fisher Scientific Co, 316 Fisher Bldg, Pittsburgh 19, Pa.

Fisher Colorimetric Titration Kit in use

Resoline Red FB

Resoline Red FB, a new dyestuff manufactured by Farbenfabriken Bayer and being offered in this country by Verona Dyestuffs, represents an important addition to the Resoline line of colors, producing a bright, bluish shade of red on Dacron.

It is said to possess good sublimation fastness, very good light and other fastness properties. In combination shades with Resoline Blue FBL, bright fast shades of royal blue on Dacron can be produced, it is claimed. It is also recommended by Verona for printing of Dacron fibers.

Eastman Fast Blue B-GLF; Polyester Blue BLF; Polyester Orange 3RLN

Eastman Chemical Products, Inc, subsidiary of Eastman Kodak Co, Kingsport, Tenn, developed three dyes during 1957, which were inadvertantly omitted from the 1957 Annual Processing Review Number. Eastman's descriptions of the products follow.

Eastman Fast Blue B-GLF is a highly dispersed dye with excellent dispersing and leveling properties suitable for acetate, triacetate and polyester fibers. It has excellent fastness to light, washing, atmospheric fading, perspiration, hot pressing, urea-formaldehyde resins, drycleaning and sublimation. The sublimation and washfastness is of particular interest on polyester fibers when high standards of fastness are required. Eastman Fast Blue B-GLF is valuable in combination shades for men's suitings, dress goods, upholstery, draperies, outdoor wear and wherever outstanding fastness to light and atmospheric fading is necessary. Eastman Fast Blue B-GLF builds up and levels well and may be dyed with a carrier or by high temperature methods on polyester fibers. On acetate fibers, it is extremely valuable in combinations of Eastone Fast Pink B-GLF, Eastman Fast Yellow W-GLF or Eastman Fast Yellow 2R-GLF.

Eastman Polyester Blue BLF dyes polyester fibers a neutral shade of blue with outstanding fastness to light, washing, drycleaning, sublimation and pressing. This dye has excellent build-up properties and is very economical for dark shades particularly in combination with Eastman Polyester Blue 3RL.

Eastman Polyester Orange 3RLN produces a red shade of orange on polyester fibers with excellent fastness to light, washing, sublimation, pressing and drycleaning. The lightfastness of this color is not affected appreciably by phenyl phenols.

GFB Light-fading Tester

The GFB Light-fading Tester, Xenotest PL393 model, a product of G F Bush Associates, Box 175, Princeton, NJ, is a research, testing, and production control device for accelerating natural sunlight effects on all materials, coated and otherwise. Among such effects are fading, photochemical changes, and discoloration of textiles, dyes, finishes, etc.

The tester's synthetic sunlight, produced by a new, precisely constructed xenon lamp with suitable filters, is claimed by G F Bush Associates to be the best continuous reproduction of natural sunlight in intensity and spectrum; see illustration, showing good match with natural sunlight, especially in the critical UV region.

The company states that such a reliable synthetic sunlight now assures a constant value for the ratio of exposure time in natural sunlight to that in the tester, as shown by the following data; acceleration of natural sunlight effects is considerable.

Light fastness step, type	1	2	3	4	5	6	7	8
Irradiation time to reach the bleaching given above, approx (hrs)	4	8	40	80	140	200	340	700–800
Irra liation time to first perceptible change	1–1.5	2–2 5	5–10	10–20	30–40	50 60	80–100	180–280

The unit's automatic operation includes safety controls. Service is said to be a minimum, eg, no continuous setting of carbon electrodes.

Test specimens are exposed to filtered light from the centrally located xenon lamp. Light intensity at the sample is approx 15,000 ft-candles. 2″ x 4″ test specimens are mounted on one or both sides of 10 specimen holders on a frame rotating uniformly about the xenon lamp. These holders may themselves be rotated a half turn for each half turn of the frame to simulate a day-night sequence for 20 specimens, if both sides are used, or not rotated for 10 specimens in half the clock time. (Total exposure time in both cases is the same). More samples may be used if smaller.

Information bulletin 158 gives general description, design features, characteristics, and information on auxiliary equipment.

Resyn 2203

Full-scale production of a new vinyl-acrylic copolymer emulsion for applications in the textile field was announced recently by National Starch Products, Inc.

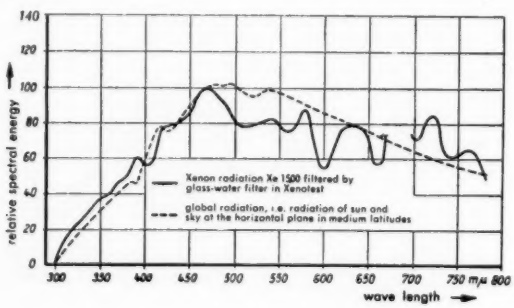
The new emulsion, Resyn 2203, is reported to be composed of extremely fine and uniform particles assuring greater surface coverage and stronger bonding properties. The resin film is said to combine excellent clarity with high oil and water resistance.

Resyn 2203 reportedly imparts flexible finishes and will maintain the glossy or lustrous characteristics of the material to which it is applied. It is based on vinyl copolymer emulsions, is internally plasticized and is said to be virtually odor-free.

Technical bulletins are available from the Resin Division of National Starch Products, Inc, 270 Madison Avenue, New York, NY.

"Stop-lite Line"

Dyed continuously by a special pad method, using three bright Sandoz water-fast dyes (Alizarine Light Green GSN, Lanasyn Brilliant Yellow 5GL, and Azo Silk Red 3B), a new three-color nylon filament fishing line permits the modern Isaac Walton to judge how long a cast he has made, and how much line is left on the reel. The product, called "Stop-Lite Line," is a braided monofilament in 8, 10, 12, and 16-lb tests. Each line is 100 yards long, divided into 33⅓ yard sections of traffic signal green, amber, and red. According to the manufacturer of the line, Rain-Beau Products Company, the line is designed for concealed spool reels. It is obtaining national distribution at present through Union Hardware—Sealand, Inc, Torrington, Conn, and jobbers in leading cities.



Fas-Dri Process

According to officials of the Fas-Dri Corp, 460 Fourth Avenue, New York, NY, a new process for finishing fabrics of cellulosic fibers, which has been in the development stage for several years, is now ready for commercial application.

The new process reportedly promises to impart to rayons and cottons important commercial qualities of wash-and-wear, wrinkle resistance, minimum ironing, spot and stain resistance, higher tensile and abrasive strengths, and quick-drying ability that rate with the more expensive synthetics. It is claimed that laboratory tests show that fabrics finished by the Fas-Dri process have vastly superior durability and longevity, and that the hand can be controlled in a wide range from soft drapability to more stiff finishes. By varying the treatment, fabrics can be made hand washable or machine launderable, it is stated. Tests reportedly show that the new finish acts as a deterrent to silverfish destruction.

Technically, the basis of the Fas-Dri process is a family of synthetic resins, ie, polyurated formol ethylene esters. The properties they impart to cellulosic fibers reportedly are achieved by molecular regrouping to create an entirely new pattern within the fiber structure. Because of a dual catalytic reaction, cross-linkage of resin and fiber molecules is achieved. The cross-linkage is said to be extremely stable because of the "thermosetting" nature of the synthetic resins.

Testing in the field has shown this process to be equally applicable to both knitted and woven fabrics. The Fas-Dri process can be applied to fabrics in most cases on existing finishing equipment, it is stated.

Chrome Fast Grey BRL

Francolor Inc, Woonsocket, RI, has introduced to this country Chrome Fast Grey BRL, a product of Compagnie Francaise des Matieres Colrantes, Paris, France.

The following characteristics of the dyestuff are cited by Francolor:

1) As fast to carbonizing as Alizarine Blue Black B Extra and quite superior to Chrome Fast Grey JL (*CI* 18160).

2) Faster than Chrome Fast Grey JL to acid cross dyeing.

3) Fastness to light superior by one-half point to that of Chrome Fast Grey JL and considerably superior to that of Alizarine Blue Black B Extra, especially in light shades.

4) Solubility superior to that of Chrome Fast Grey JL and close to that of Alizarine Blue Black B Extra.

• NAMES IN THE NEWS •

Coneybear

Savery F Coneybear has been named to the newly created position of director of new products development of the Colgate-Palmolive Company.

Mr Coneybear was formerly a director of research in the Company's Research and Development Department. He will locate in the Company's headquarters building at 300 Park Ave, New York, NY.

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Estelle M Tennis, executive director of the Color Association of the United States, retired to private life on February 1. Miss Tennis has been with the Association for twenty-nine years, having succeeded Margaret Hayden Rorke in 1954. She is a native of California and will return there to reside permanently in Oakland. Midge Wilson, Miss Tennis' assistant, has been selected to succeed her as executive director of the Association.

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Frederic Dannerth, one of the two surviving charter members of the American Institute of Chemical Engineers, described the founding meeting of the society during ceremonies on January 29th at the Engineers' Club, Philadelphia, marking the start of AICE's Golden Jubilee Year.

Dr Dannerth, an industrial research chemist and chemical engineer, maintains a private office in Glenside, Pa.

—

Willard F Spengeman, formerly manager of technical sales, has been appointed director of the newly constructed Technical Service Laboratory of Du Pont's Pigments Dept.

Ely Gonick, technical supervisor at the Edge Moor, Del, pigments plant, has been appointed assistant director of the new laboratory, which is located at the company's applied research center at Chestnut Run, near Wilmington.

Vice presidents Kenneth H Klipstein and George R Martin have been elected to the newly created office of executive vice president of American Cyanamid Co.

Mr Klipstein, who joined Cyanamid in 1933, became a vice president and director in 1957. Mr Martin has been a member of the board of directors since 1928, and a vice president for 13 years.

New appointments in Cyanamid's Organic Chemicals Division include the following:

B R Putnam Jr, manager of Cyanamid's market development since 1955, becomes manager of the Petrochemicals Department;

William D Grafton, formerly sales representative for the Dyes Department, will now be in charge of product promotion for the department as assistant to the sales manager for dyes;

J M Fasoli, legal counsel for the Division and the Company in New Jersey since 1946, has been named manager of services;

Donald C Issing and Norman J Clark have been named sales promotional representatives of the textile chemicals department.

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Tucker

Malcolm R Tucker has been appointed fatty acid sales representative by Emery Industries, Inc, for the Cincinnati territory.

Mr Tucker will be responsible for the sale of Emery's complete line of fatty acids in the territory comprising all of Ohio except the northeast section, West Virginia, eastern Indiana and Kentucky, and southwestern Michigan.

Tucker, a veteran of 10 years with Emery Industries, was a supervisor in the Production Department prior to his appointment.

VOLUME 3
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McFarlane

Samuel B McFarlane Jr has been appointed to the post of technical director and elected vice president of the Onyx Oil and Chemical Co, Jersey City, NJ.

Mr McFarlane has been with the Celanese Corporation of America for 17 years. His last position was manager of the Central Research Laboratories in Summit, NJ. In his new position with Onyx, Mr McFarlane will be responsible for planning and execution of the company's research projects as well as for all other technical functions concerning product development.

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Stewart J Hungerford, president of the Textile Technical Federation of Canada, is chairman of the program Committee for the Canadian Textile Conference which is to be held at the Queen Elizabeth Hotel, Montreal, May 6-7-8. Mr Hungerford is market analyst in the Textile Fibers Division of Du Pont Company of Canada (1956) Ltd.

—

John F Carey, former district sales manager in Charlotte for the Industrial Chemicals division of the Olin Mathieson Chemical Corporation, has been named industry sales specialist for textiles in the division's Baltimore headquarters.

Four other promotions in the sales department have been announced as follows:

James G Johns, district sales manager in Philadelphia, will assume the additional duties of assistant manager field sales for the division, reporting to Derek Richardson, manager field sales, Baltimore.

Roy L Smart, former sales representative in Atlanta, is now district sales manager in Charlotte.

Ernest H Millard, former sales representative in Philadelphia, and Edward T Hanna, former sales representative in Cincinnati, have been named assistant sales managers in their respective districts.

Cairns

James F Cairns has been named to the post of chief chemist of the Nopco Chemical Company's Textile Fibers Laboratory.

Mr Cairns joined Nopco in 1952. His last position, previous to his new appointment, was that of direct sales representative in North Carolina, a post now filled by **William F Dolan.**

Donald K Slade has joined the Polyco-Monomer Department of the Borden Chemical Company as a process engineer. He will specialize in process and project work on polyvinyl alcohols at the company's plant in Leominster, Mass. Mr Slade previously was associated with the National Paint, Varnish and Lacquer Association.

George E Martin and **Theodore Kahan** have been elected to vice presidents of Aldan Rubber Co, Philadelphia.

Martin heads the company's technical sales and service division and Kahan is in charge of research and development.

Martin is a former technologist in charge of coated fabric development for the Army Quartermaster Corps Research Laboratories. Kahan has been associated with Aldan for the past 14 years.

Aldan Rubber, which maintains sales offices in New York, Chicago and Los Angeles, has specialized in coating fabrics since the company's inception in 1909.

The appointment of **Thomas G Gibian** as general manager of the Organic Chemicals Division, Dewey and Almy Chemical Company Division of W R Grace & Co, has been announced.

Gibian succeeds **Russell L Haden,** who has joined the Virginia-Carolina Chemical Corp. Gibian will also continue his responsibilities as general manager of the firm's Battery Separator Division.

Morgan

Fabric Research Laboratories, Inc, Dedham, Mass, has announced the appointment of **Henry M Morgan** to the position of assistant director. Since 1955, Mr Morgan has been an assistant professor at Massachusetts Institute of Technology, and he will continue to lecture at MIT.

Mr Morgan joined the FRL staff as a research associate in 1948. Since 1955 he has served the firm on a consulting basis.

Alco Oil & Chemical Corp, Philadelphia, Pa, has elected **Clement H Watson,** general manager of the Atlantic Gelatin Division of General Foods Corp, a director of the Company.

TECHNICAL LITERATURE

CHEMICALS FOR THE TEXTILE INDUSTRY—*Union Carbide Chemicals Co, 30 East 42nd St, New York 17, NY*——This 28-page booklet features a section detailing major uses of Carbide's chemicals in the textile industry. It also contains an index of all textile applications of Carbide's products, and 8 pages of charts and conversion tables useful in textile research and production calculations. Extensive literature references are given for all applications, and there is appended a bibliography of booklets and bulletins helpful in development work.

Major uses for chemicals discussed in detail are: antifoaming agents and their intermediates; antistatic agents; antifume agents; conditioners; detergents and assistants; dyeing assistants; emulsifying agents and assistants; fiber synthesis and modification; finishing agents (nonresinous); lubricants; printing assistants; resin intermediates; sequestrant intermediates; shrinkage control; water repellents; and wetting agents.

Charts and conversion tables in the booklet include: a chart of the equilibrium water content of commonly used humectants; a table of the specific gravities of acetic acid solutions; a chart of the pH values of common acids, alkalies, and salts; and a chart giving the volume of tanks from linear measurements.

GURLEY BULLETIN ON TESTING INSTRUMENTS—*W & L E Gurley, Troy, NY*——New edition of Bulletin 1400 features information on instruments with complete automatic timing.

Among the instruments included is the Gurley Stiffness Tester, which measures the flexibility of sheet materials.

A section on spare parts and accessories has been added.

HOTEL TEXTILE PURCHASING GUIDE—*$7.50; American Hotel Assoc, 221 W 57th St, New York 19, NY*——The American Hotel Association has just issued a revised and enlarged edition of its Hotel Textile Purchasing Guide. The new edition contains a section on drycleaning and an expanded section on test methods.

First issued two years ago, the Textile Purchasing Guide uses newly-developed American Standard L24 Minimum Performance Requirements for institutional textiles. The Guide shows in specific terms how the hotel and institutional purchaser may be assured of quality performance in textile purchases.

The Guide was prepared for the American Hotel Association by L A Bradley, laundry and textile consultant. It describes the L24 standards compiled under the auspices of the American Standards Association.

The purchasing guide covers sheets, pillow cases, bath mats, towels, napery, bedspreads, blankets, shower curtains, awnings, canopies, curtains, draperies, slip covers, upholstery, aprons, overalls, work clothing and uniforms.

The purchaser is told in the case of each specific item that to be assured of the protection of the L24 Minimum Performance Requirements, it is suggested that the following wording appear on all purchase orders for specific textile materials; "The draperies (for example) listed on this purchase order shall meet or exceed the American Standard L24.1.5".

The Guide also contains information on the care and laundering of institutional textiles; the installation of a laundry, removal of stains, and related subjects.

t-ALKYL PRIMARY AMINES—*Special Products Dept, Rohm & Haas Co, Washington Sq, Philadelphia 5, Pa*——This newly revised, 40-page technical bulletin describes the chemical and physical properties of the company's new t-nonylamine as well as the other t-alkylamines now available. In addition, the bulletin discusses several reactions not found in the original edition. Preparation of aminosilanes, t-alkyl silicates, secondary amines, such as N-t-butylisobutylamine, and t-alkylammonium nitrites (which may be useful for vinyl foams) is presented.

VERSENEX 80—*The Dow Chemical Co, Midland, Mich*——This bulletin covers the synonyms, description, specification, properties, and uses of this broad-spectrum chelating agent, which forms stable chelates with most of the common metals.